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FISHING CHIMES

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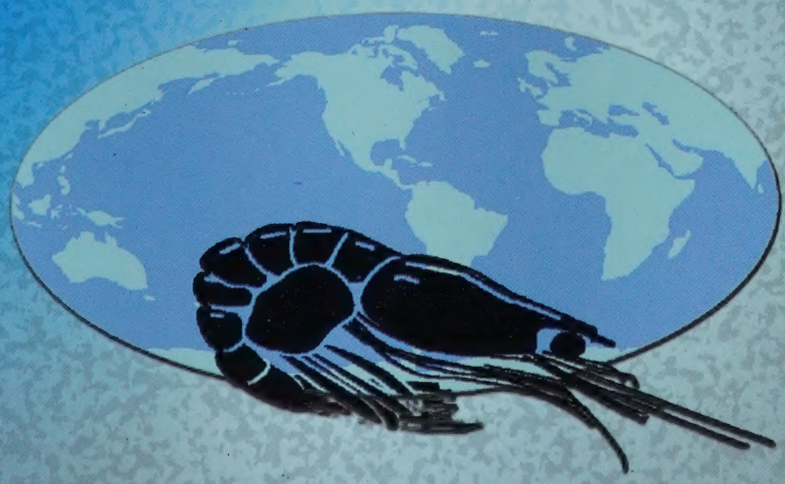

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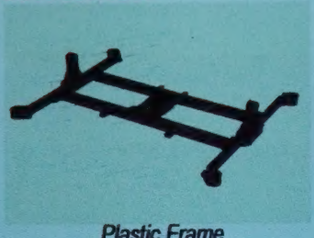

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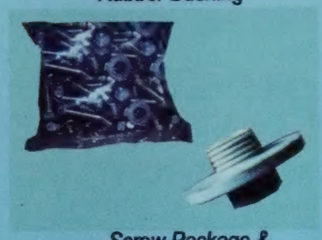

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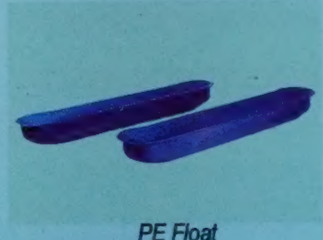

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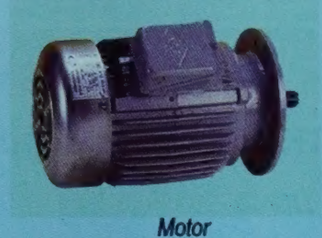

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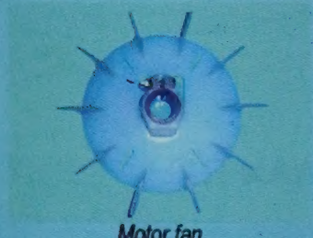

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C O N T E N T S

Role of environmental manipulation in the maturation and spawning of fish.

The various aspects of environmental control related to the reproduction of teleost fishes through induced breeding have been detailed by Mridula R. Mendon, K.M. Rajesh and A.T. Ramachandra Naik in this paper. The authors covered aspects such as manipulation of gonadal maturity and induced spawning with reference to factors such as light, water temperature, weather, etc..... 14

Prospects of Giant River Catfish (*Aorichthys seenghala*) Culture.

Unlike countries such as USA and Thailand, where catfish culture has become an established activity, in India much remains to be done for the promotion of culture of catfishes. While there have been sporadic efforts at culturing ***Magur*** and ***Singhi,*** there has been no significant impact. In this background, Ravindra N Seth tells us about the prospects of giant river catfish *(Aorichthys seenghala)* culture with a summary of the field work done by him covering its seed production and culture. He also tells us about sexual dimorphism, breeding behaviour and parental care exhibited by males, besides observations on a major constraint in its culture and also emphasising on the economic relevance. 32

Gender Bias in Fishery Literature

Arpitha Sharma articulates the unfortunate gender bias that exists in fishery literature and points out that there is no justification in the categorisation of fisherwomen separately, as they are part of fishers/fisherfolk/fishfolk. A thought-provoking contribution. 35

1999 World Fish Catch 92.86 mill t. : FAO

Global fish catch in 1999 peaked back to 92.86 mill t. which is close to the 93.61 mill t. figure recorded in 1987. India continued to maintain its eighth position in 1999 too, while China continued to occupy first position at 17.24 mill t. Peru has staged a come back to the second position at 8.42 mill t 37

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And a collection of news items

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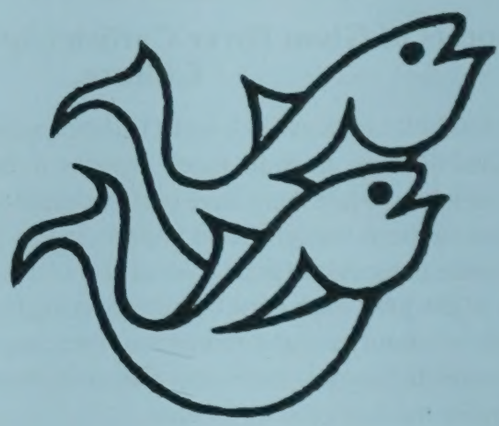

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FISHING CHIMES

INDIA'S SIL/FISHING VESSEL IMPORT SCHEME : IMPLICATIONS AND IMPACT

The Government of India issued an Extraordinary Notification on inputs in Gazette of India, Part II - Section 3 - Sub-section (ii). This embodied the addition of a new chapter, namely - "1A : General Notes regarding import policy" to form part of schedule 1 of ITC (HS) Classification of Export and Import items, 1997-2002, as per Annexure A to the notification'. Item 10 of the Table in Annexure A permits import of trawlers and other fishing vessels against Special Import Licences (SIL).

The marine fisheries resources of Indian EEZ, particularly of the demersal layer of the coastal zone and onwards to mid-distance towards the shelf stand overexploited. This has resulted over years in the annual catches plummeting inexorably. Despite this alarming situation that is causing concern, it is incomprehensible that the government of India included a blanket provision for the import of fishing vessels in the notification aforesaid. There being no conditions governing the imports except surrender of SILs, several entrepreneurs availed of the facility and are understood to have imported 19 longliners and 13 trawlers of Taiwanese and Thai origin, after fulfilling formalities such as registration as Indian vessels. They are also understood to have obtained RBI's permission for paying the cost of vessels imported on deferred payment system.

The notification has to be construed as not only entrepreneur - friendly but also as nation-friendly but partilly. It would have been totally nation-friendly too had the permissions for imports of the vessels are allowed selectively and made subject to such regulations as are imperative to ensure rational and sustainable utilisation of our marine fisheries resources. This selective approach has to be considered to be all the more necessary in respect of Taiwanese and Thai-built vessels. The need for this caution stems from the harmful experiences of the Nation, during the period of operations of Taiwanese and Thai vessels under charter terms etc., which led to the withdrawal of charter, lease and joint venture schemes.

MMD, Customs and Coastguard go by the contents of the said notification, for clearance of the imports. The absence of provision for clearance of the imports by the subject-matter department i.e., Union Department of Animal Husbandry and Dairying beforehand, has made the imports wholly entrepreneur-friendly without any relation to the possible adverse impact on the current fishery resource position. After the damage has been done by fast-track action by some of the professionals who earlier held charter/lease permissions for Taiwanese vessels, (who could now smoothly import the vessels), the flaw was noticed and a provision is stated to have been added as an amendment to the notification that prior clearance of the subject-matter department is necessary before permitting imports. It is however a moot point whether government could reverse the imports already made as these took place as per the notification and before the addition of the proviso.

Taiwan and Thailand, in the main, have traditional fishing interest in Indian EEZ. Taiwan is a global fishing nation with a very wide reach covering EEZs of a large no of countries developed, developing and under-developed. So far as Thailand is concerned, it has more of regional interest covering Indian, Myanmar, Vietnamese and such other EEZs. The traditional interest of Thailand is far older than that of Taiwan. Taiwanese interest in the resources of Indian EEZ came to light in early 1970s. In comparison, Thai vessels are known to be fishing in Andaman waters and waters off West Bengal and Orissa even prior to in dependence.

Korea too is interested in fishing in Indian EEZ but this interest is believed to be not of the same magnitude as that of Taiwan and Thailand.

All these three countries indulge in lawful fishing, (by taking permissions) to the extent possible, in the Indian EEZ, in the same way as they probably do in the EEZs of other nations such as Pakistan. In doing so, they have a compulsive motivation, strengthened by the support and encouragement they receive from their respective governments. Being nations with an inordinate appetite for fish and fish products, a characterestic which cannot easily be appreciated by an average Indian, their governments have no option other than supporting their fishing companies to spread out into waters of other nations with what all they can do to ensure the entry of their vessels into alien waters, for the reason that fisheries

of their own EEZs already stand overexploited. For example, if deregistration of a vessel is necessary to enable her to get registered in another country, it is stated that, for tactical reasons, the government concerned, may do so.

At a time when these countries are understood to be worried about the withdrawal of chartering/leasing schemes and the embargo placed on any further joint ventures by the Indian government, the present Notification of Indian Government announcing SIL scheme involving provision for import of fishing vessels by Indian enterprises must have come as a boon and balm to Taiwanese and Thai interest and the Indian professionals in charter business in the past, to resume their activities again in a lawful way. In fact, the SIL notification provided an excellent opportunity to transform the banned chartering and similar systems into a regular 'Indian-owned' fishing activity, while at the same time preserving all the features of the charter system, including provision for permissions to their crew members for vessel operations. One difference between the past and the present with no disadvantage is : under charter system 20% of gross earnings were going to the Indian side and the rest to the owners. Now as 'Owners', the Indian side receives first the entire amount earned out of 'their exports'. meeting expenses out of these returns as required by the 'foreign' owners on bunkering, wages to crew and under other heads while also ensuring that a minimum of 20% of gross earnings remain as their earnings.

Quite a few issues which are related to the policy aspects, and the manner in which the old charter conditions are camaflouged deliberately, leading to exposure of national inadequacies and weaknesses to other nations, arise from this situation. In other words, what appears to have happened is that, government banned chartering of foreign fishing vessels and related systems, only for bringing back virtually the same systems in another form. Under the SIL/Import system, the vessels imported are registered as Indian vessels, may be with proofs of deregistration of earlier registrations. Payments towards the cost of imported vessels is allowed ostensibly through deferred payments, but this is only another form of allowing the 'sellers' (who obviously continue to have real ownership) with their crew to fish and to take the catches stored in the vessels as an 'export', but in actual terms taking back their own catches, thanks to the access secured by having their vessels technically imported by Indian enterprises. This inverted system too no doubt yields foreign exchange but it also displays a transparent deception that is quite good for record as India's own operations although they are actually otherwise. This SIL/import policy is, in actual fact, a continuation of the earlier charter and other systems by way of another ***avataar****. Further, joint venture system involving Taiwanese/Thai/Chinese vessels permitted earlier, is now confined to a few for the reason the joint ventures could not be cancelled because of the provisions governing them. The withdrawal of the scheme later put a stop to such joint ventures a new as a further development, the present import system has removed all inconveniences such as frequent checks and clearances involved in the earlier charter/lease/joint venture systems. The camaflouging of the continuation of the same policy of charter/leases in the guise of imports whether meant or not, in an improved manner, is thus apparent. Looked at from any angle this is a national shame. Old wine is accomodated in a new bottle.*

It is by now common knowledge that our marine fisheries resources, particularly of the coastal zone and onwards towards the shelf are overfished. Does this situation, by any stretch of imagination, call for free and unfettered imports of fishing vessels? In fact, one can ask, what considerations made the government to think of permitting unfettered imports of fishing vessels, particularly when there is a burning resource utilisation problem fully within its knowledge? The anamolous policy decision would appear, to quite a few other discerning nations too, as the excercising of an unjustified policy option.

It can no doubt be conceded that imports of fishing vessels are necessary. However, the imports can only be allowed on case to case basis, keeping in view the resources position, need for upgrading capabilities of small enterprises to exploit unutilised pelagic resources such as tuna. One wonders : whatever has happened to the Union Fisheries Division to remain quiescent when such a disastrous formulation was being made. The post-notification stipulation providing for imports of vessels only after the needed clearance is given by the Fisheries Division of Union Department of Animal Husbandry and Dairying can be of use, if any, for applications received from now onwards only, as the damage has already been done. Very few countries outside the 'elite' nations of 'Professional Calibre' would be interested in accepting exports based on deferred payments without guarantees. As imports of a sizeable number of vessels have already been permitted by the government, if the Indian enterprises concerned happen to go to a court of law to contest the seizure of some of these vessels reported to have been made by the coastguard, the notification of the government itself could come in the way, making the imports ineffective, but possibly there can be other justifiable reasons for the seizures and it is difficult to visualise what the government has up its sleeve.

As already indicated, there appears to be no influence whatsoever of the present status of our fishery resources on the introduction of SIL/Fishing vessel import scheme. Further, the motivation for extending the SIL scheme to cover import of fishing vessels too is not clear to the industry. So much so, the Association of Indian Fishery Industries has expressed itself against the import provision in the present form, which was apparently made without consulting it, or for that matter, may be even without consulting the Union Department of Animal Husbandry and Dairying. If this scheme is allowed to be continued, as it is, the Nation would be owning its EEZ, from fisheries angle, mainly for the benefit of foreign fishing vessels of the 'elite' group whose aim can only be to keep the main fisheries our EEZ within their grip and confine the Indian Industry to its present pathetic status.

Having said this, we have to concede that there is no escape from dependence on foreign expertise for the introduction of vessels, particularly longliners for fishing for tuna, whose stocks in the EEZ remain mostly unexploited (excluding the stocks taken away by poachers), and of trawlers for deepsea fishing in the oceanic depths. It has also to be conceded that the provision for imports in the notification is justified. What is not justified is the blanket nature of the provision that is totally oblivious of the resource dynamics of Indian EEZ, non-availability of trained men, needed infrastructure to the fullest extent etc.

The fishing industry and the government are the best judges of the ongoing joint ventures with the Taiwanese (organised through Singapore or Honkong companies, for the reason that Taiwan has no diplomatic relations with us) and Chinese and Thais. The role of the companies of these countries in the joint ventures is one-sided and dominating. For them, the joint ventures are just a mechanism to gain access to our EEZ. Accordingly, the operations are not designed either for transfer of technology or for eventual real transfer of the vessels registered ostensibly under Indian flag. The Indian companies can be totally at the mercy of their foreign partners, who can just take back their vessels, either to come back at their convenience or not to come back at all. It looks that for them the main role played by the Indian counterpart is to secure needed clearances or facilatating needed clearances in India. This situation is not honourable. However, there is one merit and that is the activity yields some foreign exchange without much of investment and without any effort at fishing management. The vessels can never be amenable for operations by Indian companies by themselves and with Indian crew. Efforts were made by Indian enterprises in the past to operate one or two seized Taiwanese vessels but these were unsuccessful.

The system of payment of the cost of the vessels to the 'foreign owners' in instalments deserves support, if the vessels could later be operated by Indian crew alone. At the time of permitting import itself this has to be established and the authorities should be convinced of this. If this is considered not possible, there can be no point in permitting such imports, as the vessels (Taiwanese, Chinese, Thai, Korean) remain as foreign vessels for all practical purposes, although labelled as Indian.

Taiwanese vessels that operated in Indian EEZ under charter/lease terms are known to shift their fishing venue to other EEZs when fishing in Indian EEZ is dull for them. The days covered under such fishing activity used to go unaccounted for and used to form part of travel days and stay at the place where catches were sold. This being the pattern, the same can be expected to be applied to the 'Indian owned' vessels of the 'elite group' (known to have registration in another country besides Taiwanese registry, prior to registration in India).

In the case of exports of catches of these vessels, the Indian side has only one option, i.e., selling the catches (which are actually harvested by the foreign owner from whom the Indian owner could secure technical ownership) to the same 'foreign owner'. The invoice preparation would follow the same pattern as under charters etc., which is generally known, but in an inverted manner.

In a long term perspective, it is desirable not to allow import of fishing vessels under deferred payment terms from countries of the 'elite group' such as Taiwan and Thailand who have traditional fishing interest in Indian EEZ, unless it is established beyond doubt that the imports from these countries are not akin to charter/lease systems in a different form.

Efforts at marine fisheries development through imports of vessels without linkages with associated matters such as promotion of fishing capabilities, upgradation of shore infrastructure etc., and without linkages and integration with related activities would not yield tangible and purposeful results. It is therefore desirable to link the provision to permit import of fishing vessels to integrated fishery projects to be taken up under bilateral agreements with developed friendly countries whom the government can trust. In the Indo-Pacific region we have two developed countries in the fisheries field. These are Australia and New Zealand. Mexico has expertise and it is stated that Indonesia has taken to longlining in a big way. Government can negotiate, develop and sign a bilateral fisheries agreement with one of them. The main aspects of the Agreement can revolve round the promotion of integrated longlining in Indian EEZ and probably elsewhere too for mutual benefit, with identified points of responsibilities applicable to each of the sides, one of which will be according permissions to individual companies of the respective countries to enter into joint ventures and also on other aspects such joint ventures could cover. Provision for providing financial assistance by the foreign country concerned to facilitate imports of vessels and other equipments by Indian enterprises, guaranteed by Indian government, transfer of technologies including those related to post-harvest operations, and training and education aspects etc., could be part of the suggested bilateral agreement.

Camouflaged imports that would have all ingredients of erstwhile charter/lease system would no doubt be entrepreneur-friendly and would also bring in foreign exchange. Such imports would not however be wholly nation-friendly in that the operations will be totally controlled by the foreign fishing companies with the role of the nation getting virtually reduced to providing access to the vessels to fish in Indian waters, and with the Indian entrepreneurs playing the role of dummy owners and receiving some returns as foreign exchnge at their mercy. This would certainly be a national shame and would reflect our inability to develop on our own pelagic and deepsea fishing and leaves an interpretation of playing into the hands of global players in the fishing game. The nation has to avoid this shame and this is possible only through taking up projects under bilateral agreements with friendly countries as suggested in the preceding paragraph.

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Problems and Prospects of Fisheries in Assam

K.Kalita, S.K.Bhagabati and O.K.Dutta
College of Fisheries, Assam Agril. University
Raha-782103, Assam

During the last 30 years of history, the geographical boundary of Assam has been reduced to one third of its original shape. It is a land locked State far away from the sea, situated in the North east India, adjacent to the state of West Bengal and internationally bordering Nepal, Bhutan and Bangladesh.

Two important physical factors divide Assam into a) Brahmaputra and b) Barak valleys. The State is mostly dominated by Brahmaputra valley where the total length of the river is estimated at about 2,900 km. Its drainage area is roughly 9,35,500 sq.km. Rainfall is the highest in the world (between 178 and 305 cm.), concentrated mostly in four months i.e. June to September. The State very often experiences floods and droughts. As per 1990-91 census the population of the State is 19,897,000 and nearly 90% of them are fish eaters. The present per capita consumption of fish in Assam is 6.70 kg./ annum as against the all India average of 11 kg./annum. As the fish is considered to be the staple diet of the people of Assam, the demand for this item is obviously high, but not contributing to the nutrition of protein starved millions to the extent it should mainly due to existing gap between demand and supply. Based on 1991 census, the requirement of fish of the State comes to 2,21,000 m.t. but the actual production had touched the figure of 1,59,768 tonnes during the year 1999-2000 against a demand of 2.50 lakh tonnes. The demand is likely to go up to about 3.2 lakh tonnes by 2000 A.D.

Fisheries Resources

Owing to the diversity of topographic and climatic features, the fishery resources are also diverse and varied. The areas of these resources are highly productive. Since the State has no coast the fisheries sector is exclusive to by the inland sector. This sector comprises both culture as well as capture fisheries. Culture fisheries depend on fish farming in the ponds, tanks and canals. Presently the major catch however comes from capture fisheries only. One of these, the mighty Brahmaputra, drains the North eastern states of Arunachal Pradesh, Assam, Meghalaya and Sikkim, besides the southern slopes of the tiny Himalayan Kingdom Bhutan. Dihang, Dibang and Lohit rivers of Arunachal Pradesh join near Sadiya in Lakhimpur district and assume the name Brahmaputra, which flows from east to west and divides the State into north and south. The river flows for a length of 730 km. in Assam and finally enters Bangladesh as the river Jamuna. The river Brahmaputra is having 42 tributaries of which 27 on the north bank and 15 on the south (Table-1) and a has a combined length of 4000 km. and a catchment of 5,80,000 sq.km. and an average annual discharge of 510450 mill . cubic m (Rao, 1979). The river is characterised by multiple flood cycle and pronounced seasonal variability in discharge. The rivers and its tributaries maintain most unstable courses in the plains area with constant shifting. Heavy rains, topography and frequent earthquakes have made the river capricious and destructive. These adverse features have resulted in the formation of flood plain lakes, a vital resources in the Brahmaputra valley (Annon, 1991), the geologically infant area of the Himalayas which contributes substantially to the high silt content in the drainage (Verma, 1984). In the north bank, tributories are much larger in size, having steep slopes and shallow braided channels. On the other hand south bank tributories are comparatively of flat gradients with deep meandering channels. In the upper reaches for about 530 km. upto Guwahati city, the Brahmaputra flows over steep gradient maintaining strong current both at surface and underneath. This has rendered commercial fishing with the existing indigenous craft and gear impossible. The remaining stretch of the rivers lies between Guwahati and Dhubri (about 200 km.) fished commercially due to congenial topographical reasons. The water exhibits optimum temperature of 15.2 -

Table 1 List of North and South bank tributaries of the river Brahmaputra in Assam ***(Reprinted from Threatened Fishes of India).***

	North Bank		*South Bank*
1.	Sankosh	1.	Jinjiram
2.	Gadadhar	2.	Krishnai
3.	Saral bhanga	3.	Dudhnai
4.	Champamati	4.	Singra
5.	Aie	5.	Kulsi
6.	Manas	6.	Digaru
7.	Beki	7.	Kollong
8.	Pahumara	8.	Dhansiri
9.	Pagaldiay	9.	Kakadanga
10.	Puthimari	10.	Bhogdoi
11.	Baralia	11.	Janjai
12.	Bornoi	12.	Dikhow
13.	Nonadi	13.	Disang
14.	Mangalodoi	14.	Dibru
15.	Jia Dhansiri	15.	Lohit
16.	Panchnoi		
17.	Belsiri		
18.	Gabharu		
19.	Jia Bhorelli		
20.	Buri Ganga		
21.	Borgong		
22.	Burai		
23.	Dikrang		
24.	Subansiri		
25.	Jia Dhal		
26.	Ranganoi		
27.	Dihang		
28.	Dibang		

Table 2 Existing fishery resources in the state of Assam.

1.	Riverine fisheries (length=4820 Km.)	2,05,000 ha.
2.	Beel fisheries	1,00,000 ha.
3.	Forest fisheries	5,017 ha.
4.	Swamp, vast length	10,000 ha.
5.	Ponds and tanks	23,000 ha.
6.	Reservoir fisheries	10,730 ha.

Source : State fisheries, Annual Review, 1993-94.

27.6°C, dissolved gases, particularly O_2 and CO_2, do not show seasonal variation during the periods of high turbidity. River Barak flows from north to south in south eastern regions of the State, having a total length of 400 km. It is fed by 7 northern and 6 southern tributaries. Some places of this river are below the mean sea level (MSL) and their gradient is very flat. Commercial fishing is practised in the entire river. Apart from the riverine resources, the State is also gifted with myriads of swampy areas locally called as beels or jeels which are extensive water sheets connected to mighty river Brahmaputra, Barak and their tributaries. The number of beels is estimated to be about 1392 of which 423 (30.4%) are registered while the rest 969 (69.6%) are unregistered but are controlled by the Government (505) as well as public (464) sector. The waterspread area of these beels are estimated to be about 1.0 lakh ha. which alone contributes about 80% of total lentic water of the State.

Initially there were no reservoirs in the State. Recently two newly constructed reservoirs, namely - Umranchu in North Cachar Hills District with a waterspread area of nearly 13,000 ha and Kapili in Karbi Anglong having water spread area of about 30,000 ha. came into being. Pagladiya in Nalbari District and Puthimari reservoir (Suklei Dam) near Rangia are in various stages of construction and would form additional fisheries resources of the State in years to come. Table 2 shows the existing fishery resources in Assam.

Status of fish/seed production

Fishery plays a significant role in rural economy but the employment scenario of rural areas particularly in Assam and N.E. States in general is dismal. It is a sorry state that, despite having a vast good potential sources of inland water bodies, the development of the fisheries of the State still remains tardy. Some of the basic problems are a) low productivity, b) low pH values of soil and water, c) soils of Brahmaputra valley are sandy with high concentration of Potash and Phosphorous and moderate quantity of organic matter and Nitrogen, d) natural calamities like flood and drought, e) poor extension facility, f) high rate of illiteracy, social taboo, lack of entrepreneurship, g) lack of credit, h) non availability of quality good seed and marketing channels etc. If these resources could developed scientifically in a planned manner solving the above mentioned problems, the State would not only become self sufficient but would also be capable of exporting fishes. In order to achieve this goal the overall input required is quality seed. During 1997-98 the State produced about 2246 million fry and made the State self sufficient in fish seed production. The State has now 80 eco-hatcheries in the private sector. Three departmental eco-hatcheries and two others are completed so far. Apart from these Glass jar hatcheries and, mini bundhs also are contributing to augmenting fish seed production in the State. Presently 300 happa breeding units exist in Karimganj district.

Need, scope and constraints in augmentation of fish production.

As per nutritional requirement, the State requires almost double of the present production to conform with all India average consumption. Between the present level of production and the actual requirement for the State there is a strong gap. With majority of populace of the State being fish eaters and expected increase in population during course of time, it is imperative that fish production has to be augmented.

As discussed already, resources are immense for fish production but present level of production continues to be low. Major portion of the river Brahmaputra is not commercially exploited for want of suitable gears. Presently indigenous gears are used for fishing by the traditional fishermen. Some of the experienced fishermen started operating modern craft and gear. Majority of small rivers, rivulets and hill stream are lying nearly fallow. They need be properly stocked and harnessed. Lack of regulatory measures for conservation of fish stock and industrial pollution are added constraints in development of the fishery of these resources.

The newly constructed reservoirs are mainly for the hydrostatic and irrigation needs. Fishery development is secondary. Suitable management of fishery of very few of the existing reservoirs have recently been initiated but not being exploited commercially, or if done, by traditional method only.

Though the beel fisheries constitute a major resource area, its contribution to the fish production in terms of potential area is very much discouraging. There are some problems confronting this resources considerably, due to continuous accumulation of putrified matter rendering feeding canals shallow, thereby hin-

Table 3. Fish productin in major hill states during 1994-96

Sl.No.	*States*	*1994-95(t.)*	*1995-96(t.)*
1.	Arunachal Pradesh	1850	1800
2.	Assam	1,55,060	1,53,000
3.	Manipur	12,500	12,010
4.	Meghalaya	3,580	3,950
5.	Mizoram	2,500	2,000
6.	Nagaland	3,000	2,500
7.	Tripura	25,710	25,100
8.	Himachal Pradesh	5,940	5,280
9.	Jammu & Kashmir	16,520	10,100

Source: Fishing Chimes, April/2000.

dering the autostocking process. It is pathetically observed that most of the beels are highly infested with vegetation, thereby deterorating the water quality for fish. At the time of revenue settlement, some of the beels, feeding canals are not included as part of the main beel fishery, thereby the lease holder is not able to take up any developmental measures in these beels. Consequently, the feeding canals become dried up and sometimes the beels periphery is also blocked by the encroachers. A handful of beels area exists under the purview of forest department and these are pathetically lying fallow. These areas should be brought under the fishery department and developmental work should be taken up in a phased manner.

In regards to ponds and tanks, most of the farmers of the State practice traditional method only. Majority of the ponds tanks are being utilized unscientifically. Most of the farmers have not yet taken to fish farming as a profession but only as a secondary source of income for their livelihood. Also the production levels suffer due to poor broodstock management, unconscious negative selection of broodstock, unplanned cross breeding in hatchery stock, close mating of spawners resulting in inbreeding depression and genetically deterorating situation. There is tremendous scope for integration of fishery with live stock management and paddy cultivation. Five types of integration are available 1) Pig cum fish 2) Poultry cum fish 3) Duck cum fish 4) Paddy cum fish and 5) To some extent fish cum horticulture practices.

Live stock population of the State is indeed large with pigs being 53/100 persons and Poultry birds 63/100 persons. Paddy is the main crop of the region and is mostly cultivated in vast stretches. These systems can be utilised for fish production in suitable areas with minimum input and maximum expected return. The technologies are best suited for rural setup where one of the components is already being practised. Integration of fish culture with livestock is widely used and the pigs are generally maintained by economically weaker sections of the community and very little attention is paid to them. In regard to paddy cum fish culture it is not practised widely in the country in general and the State in particular.

Rational utilization and development of vast available fishery resources of the State is the need of hour. This would help not only in providing to million of protein food to millions but also in opening up self employment opportunities for the economically downtrodden populace of the area. It would lead also to diversification of the rural economy.

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Upper East Coast : Seasonal shrimping starts on a Dull Note

The anticipated bumper shrimp harvest in the first flush after the closed season that ended on 31st May along the east coast, particularly along its upper region, has been disappointing. The result was that large and small boats that set out, particularly from Visakhapatnam and Kakinada, have cut short their voyage duration and returned back to the ports so as to avoid losses. The operational expenses, because of rise in diesel prices and other costs, which range from Rs. 50,000 for mechanised boats to Rs. ten lakhs for larger vessels, are stated to be very high compared to anticipated returns from the reduced shrimp catches. The returns anticipated have also shrunk because of fall in export prices of shrimps, particularly browns, which normally constitute bulk of the catch.

Overfishing of shrimp brooders for supply to the hatcheries can be one of the reasons for the failure of the first round of shrimp fishing. It is possible that, because of the recent rains, conditions in the Bay may have hopefully become conducive for the next breeding round and this may revive the fishery. Further, for biological reasons, failures in breeding of shrimps take place once in three or five year cycles and the present one may be one such. The prevailing cyclonic weather also may have inhibited fishing operations to some extent resulting in scanty catches.

Apart from the catch position which may soon improve, what is not likely to improve is the high cost of operations and falling brown shrimp prices. The situation is so bad that intervention by the government is inescapable to bale out the operators from the situation. The Associations concerned may have to make representations to the government on the plight into which the industry has landed, after the closed season.

Fish and Fishery of Upper Lake, Bhopal (M.P.)

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Upper Lake of Bhopal is having a length-wise stretch of 13.96 km. About a dozen fish species and a few prawn species occurring in the lake are commercially important. The cat fishes, major and minor carps and other miscellaneous fishes are the main species constituting the catch. Fishing gears used are gill nets, cast nets, shore seines, traps, hooks and lines etc.

The improvement in the design and operation of the nets is needed for improving the catch from the lake. Local fishing crafts are primitive and need improvement.

Over 500 fishermen are engaged directly and 2,000 indirectly in activities related to fishing activities. Their socio-economic conditions need a lot of improvement. The present status of fish and fishery of the lake and suggestions for its improved management are dealt with in this communication.

Bhopal, the capital city of Madhya Pradesh, is known as the city of lakes. A number of important lakes, rivers and reservoirs are situated in and around the city. Upper Lake (*Bada talab*), Lower Lake (*Chota talab*), Shahpura Lake, Kolar, Kerwan, Kaliasaut, Halali, Dahod, Laharpur, Chiklod, Barna, Hathaikheda, Ghorah Pachharh reservoirs are some of them. Bhopal is credited with sport fishing tradition which was promoted by the erstwhile rulers of the State. This is evident from the fact that the emblem of the flag of erstwhile Bhopal State bore a pair of fishes. A part of the results of study, undertaken on the fisheries of Upper Lake of Bhopal by the first author during 1998-99 for the completion of his dissertation on the subject is presented here.

Location of the Lake and its fishery: The Upper Lake is situated at Latitude 23° 13' N-23° 16' N and Longitude 77° 19' - 77° 24'E. Its water spread area is 3,500 ha and maximum depth is 11.70m. The lake provides drinking water supply to the city of Bhopal, and provides opportunities of fishing, trapa cultivation and recreation. The lake is surrounded by thickly populated urban centres, which discharge large quantities of untreated sewage directly into the lake. Present fish landings from the lake are about 90 - 100 tonnes per annum. The average catch is 25-28 kg/ha/annum, against the national average reservoir fish catch which is in the range of 8-10 kg/ha year. Maximum fish landing from the lake is recorded during April to June when water level is low and shore seine operation is possible to catch smaller sized weed fishes.

Table 1 : IMPORTANT SPECIES OF FISHES AND PRAWNS OF UPPER LAKE

Scientific name	*Common name*	*Local name*
Labeo rohita	Rohu	Rohu
Catla catla	Catla	Catla
Cirrhinus mrigala	Mrigal	Mrigal
Cyprinus carpio	Common Carp	Common Carp
Ctenopharyngodon idella	Grass Carp	Grass Carp
Hypophthalmichthys molitrix	Silver Carp	Silver Carp
Clarias batrachus	Magur	Magur
Heteropneustes fossilis	Singhi	Singhi
Puntius ticto	Fire fin barb	Punti
Notopterus notopterus	Feather back	Patola
Mystus seenghala	River cat fish	Singhar
Wallago attu	Freshwater shark	Padhin
Channa striatus	Striped Snake head	Samal
Mastacembelus armatus	Eel	Vami
Macrobrachium dayanum	Prawn	Jheenga
Macrobrachium lamarrei lamarrei	Prawn	Jheenga
Caridina weberi sumatrensis	Prawn	Jheenga

Important exploited fish species of the lake comprise Indian major carps (15%), minor carps (12.5%), cat fishes (25%) and other varieties (47.5%). The list of important fishes and prawns available in the Upper Lake are given in Table 1.

Fishing Nets: The gill net, locally known as "Fansh Jal", is the most common gear used in the lake. The net is set in the evening time and hauled in the morning hours. At times the net is used during day time too. Gill nets of 100 - 200 feet length and 3 - 8 feet breadth are operated. The gill nets operated in the lake are having head rope only on which thermocole floats are placed at intervals of 75 feet. In between, small wooden sticks are tied with gaps of 10-12 feet. Stone sinkers weighing 2.5 - 5 kg are tied at both the ends. As no foot rope is used, the net does not retain proper shape and mesh openings are not effective in gilling the fish, thereby reducing the catch. The other types of gill nets operated are : a) *Bhakkar Jal* with bigger mesh size b) *Palli Jal* with medium size meshes, and *Kareli Jal* with smaller mesh. The design of the nets take into account the size characteristics of the targeted fish. The colour of gill nets is generally green but according to George *et al.* (1975) yellow coloured gill nets are more effective in reservoirs.

Cast net, locally called as *Ghumaua Jal* is similar to those used in various water bodies of India. It is operated in shallow waters near the shore line to catch small sized fish. Another type of net used is the Scoop net. It is locally known as *Pilna* and it is triangular in shape. Made out of mosquito net webbing it is used for catching very small fishes and prawns. A special type of trap called "Chapar" is also used. It is about 10-12 feet in height and 3-4 feet in diameter at the base. It is made of 8-12 bamboo sticks and webbing is attached to these sticks. The trap is used to catch carnivorous fishes with burrowing habit like catfishes, murrels and Eels etc. On sighting a shoal of fishes the trap is used to encircle the fishes in the area closed by the trap. Fishes are picked by hand from the opening at the top. Another tackle used is a primitive type of longline the main line of which is made of cotton twine. Several vertical lines are attached to it at intervals of five feet. The longline is operated at a depth of 5-10 feet. Thermocole floats are used for positioning and marking the line. The baits used include small fishes, clams, frogs and wheat flour balls etc. The use of hazardous material like poison and explosives is not reported in the lake.

Crafts: The only craft used is the wooden flat bottom boat called "Donga". Its length varies from 10-14 feet, width is 1.5 feet in the front and 2.5 feet in the rear side. The height is 1.5 feet. The wood used for construction of boat is teak (*Tectona grandis*) called as "Sagaun". The cost of each boat is around Rs. 12,000 and its life is 10-12 years. The M.P. Fisheries Corporation is having a boat building yard where FRP and wooden boats with plywood are being constructed. The high initial cost is a problem faced by fishermen for buying them. FRP boats have longer life and they are maintenance free and eco-fiendly. Inflated rubber tubes are also used as fishing crafts in the lake. Several wooden platforms are constructed to enable fishermen to operate hook and line which is a very popular sport fishery in Bhopal. It is observed that most of the catch in hook and line comprise of carnivorous fishes and such fishing helps in controlling the population of carnivorous fishes and better survival of cultivable fishes.

***Trapa* Culture**: Fishermen of Upper Lake are engaged trapa cultivation for generations. There is a debate on the desirability of banning this activity. This culture system is to be seen in total ecological context and can be continued until it is scientifically proved to be detrimental to fisheries.

Productivity: While productivity of the upper lake is considered to be at a satisfactory level, definetely there is scope to increase it further by undertaking an optimum level of stocking in a manner that a capture-culture balance is achieved and maintained. As the lake is having a high population of carnivorous fishes, the size of fingerlings released should be above 100 mm. for better survival. There is a closed fishing season from 15th June to 15th August, which needs to be enforced strictly. One reason for this is that gravid fishes are available in the market during the breeding season. In conclusion, it has to be said that, there is need for a detailed study so as to facilitate formulation and implementation of measures for the management of Upper Lake with special emphasis on pollution control.

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Pakistan waives duty on imported Shrimp Seed

Pakistan's commerce minister Abdul Razak Dawood is reported to have announced recently the waiving of duty on imports of overseas shrimp seed for boosting shrimp culture in Pakistan, according to industry leaders.

While it is felt that this waiver would provide a boost to shrimp culture in Pakistan, there is also a strong view that Pakistani farmers should rely as far as possible on local wild shrimp seed and also make efforts at producing the seed in hatcheries. There is an exhortation that Pakistan scientists must develop and master an indigenous technique to culture shrimps from their own seed.

A view is expressed that, eventually, Pakistan may have to opt for hatchery seed production and culture of hatchery-produced PLs. At the same time, there is the realisation that it take a long time to master the technology. At present extensive and semi-intensive shrimp culture systems are followed, utilising imported shrimp PLs.

Source : *Fish Farming International* : April 2001

Role of Environmental Manipulation in the Maturation and Spawning of Fishes

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Spawning is characteristically and generally an annual event among fishes, with the mature eggs and sperm production taking place at a time of the year when external conditions and the availability of food are most favourable to the survival of the fertilized embryos and developing fry. Most of the fishes use seasonal patterns of changing day length and temperature, the presence of food, or the onset of rainfall to time gonadal maturation and spawning at the appropriate time. Although factors from the external environment are responsible for the initial induction and subsequent course of reproduction, it is the hormones produced by the endocrine gland that play a major part in the process.

Environmental manipulation is a primary requirement as far as broodstock management and good farm practices are concerned. It is an important step that facilitates the total control of sexual maturation and spawning of the aquatic organisms under culture. Without this manipulation farmers would have to rely completely on collection of wild broodstock, spawn or fry in order to complete the production cycle. Amongst the methods of controlled reproduction in use at present, one would include induced breeding or hypophysation, environmental manipulation and cryopreservation. The environmental factors play an important role in stimulating the hypothalamic centers in the brain. The brain becomes the transducer for relating sensory detected environmental changes with subsequent endocrinal changes required for reproduction.

The stepwise control of reproduction and some of the hormones used to induce spawning artificially are as follows.

Environment
⇓
Brain
⇓
Hypothalamus
⇓
Releasing hormones
⇓
Pituitary gland
⇓
Gonadotropic cells
⇓
Gonadotropic hormones
⇓ ⇓
Eggs ⇐ Ovary Testis ⇒ Sperm or Milt
⇓ ⇓
Estrogens Androgens

In response to the changing conditions in both the internal and external environment, a part of the brain known as the hypothalamus secretes small peptide hormones called releasing hormones. These pass a short distance to the ventral surface of the brain, just above the roof of the mouth of the fish, where they control the activity of specific gonadotropic cells in the pituitary gland. These cells secrete gonadotropic hormones, which pass in the blood to the gonad of the fish where they control all structural and functional changes in the testis and ovary. Gonadotropic cells influence the secretion of hormones from the gonads. These directly control all aspects of gonadal growth and maturation.

There are two ways of environmental control in the reproduction of teleost fishes. These are:

1. Manipulation of Gonadal Maturity: Manipulation of gonadal recrudescence and regression so as to enhance, maintain and/ or prolong gonadal maturity for producing spawn as and when required.

2. Induced spawning: The most important environmental factors, which influence successful breeding to a great extent are light, water, temperature, condition of the water, weather etc.

1. Light: Early maturation and spawning of fish enhanced by photoperiodic regimes have been reported. However, there are also observations on delayed maturation and spawning of some species of fish in northern latitudes where photo period regimes are of low intensities. In contrast, in one of the studies in India, the minor carp, *Cirrhinus reba* has been observed to attain early maturity under experimental conditions of short light periods and delayed maturation under long light periods. These instances tend to show that the requirement of light for activation of reproduction cycle varies from species to species and from place to place.

2. Water temperature: Temperature is one of the most important factors, which stimulates maturation of gonads and accelerates spermeation. It has also an indirect effect on pituitary by regulating the release of gonadotropin. In the case of carps, successful spawning takes place within the range of 24-31°C optimum being 27.5°C. Though spawning occurs at high temperatures (35-38°C), the percentage of fertilization and hatching of eggs can be low, as a higher temperature may cause mortality of the hatchlings.

3. Weather: Cool and rainy days are more conducive to spawning than other days. It has been observed that highly success-

ful spawning is induced on cloudy and rainy days, especially after a heavy shower or when the weather is cool. Accumulated freshwater and rainwater give better results as they influence maturity and spawning of fishes to a great extent.

4. Water flow: Constant flow or circulation of water ensures better results. Constant flow keeps the water cool on one hand and on the other it might impart a sort of stimulation to the brooders. As dissolved oxygen increases in circulating water, continuous aeration enhances it supply.

5. Time: Spawning takes place both during the day and in the night. However, it happens that hot and strong sunny days do not give satisfactory results.

6. Turbidity: High turbidity in stagnant water may cause mortality of hatchlings. It has been observed that fishes breed successfully in a wide range of turbidity from 100-1000 ppm.

7. pH and Dissolved oxygen: Spawning occurs at a fairly wide range of pH and dissolved oxygen content of water.

Work carried out on Fishes

Of greater practical application for altering the rate of maturation and time of spawning is the use of temperature and photoperiod regimes. Generally, fishes, which inhabit water bodies in higher and lower latitudes respond to changing daylength (Salmonids and flat fish), whereas sub tropical and tropical species like the carps are much dependent on cycles of temperature or the timing of onset of rainfall.

Carps are probably the first fish on which environmental control of spawning was practiced. In the common carp maturation is stimulated by temperatures in excess of 17°C and in the range of 21-25°C. Grass carp and catfish have somewhat higher temperature requirements. In Salmonids and sea bass adjustments of seasonal rate of change of photoperiod into shorter and longer periods produced advanced spawning activity and delays of three to four months respectively in the time of spawning with no adverse effects on the quality of eggs and fry.

Philip and Davies *et al.*, (1986) collected Japanese common carp weighing about 300-1600 g from a mixed stock of one to two year old fishes. The fishes were reared in cool water for about two to six months and then they were transferred to warm water (24±°C). Two subsamples were taken, out of which one was exposed to 24°C with unchanged photoperiod while the other was exposed to increased temperature as well as change in the photoperiod. They found that the first sub-group failed to spawn, whereas the second sub-group spawned heavily. This shows that, in case of common carp, temperature alone will not affect maturation and spawning but variations in temperature as well as photoperiod lead to high maturation and spawning success.

Series of experiments performed on sea bass by Zanuy *et al.*, (1986) showed that spawning time could be delayed either by temperature or photoperiod manipulation. Spawning time peaks during February under natural photoperiod and temperature conditions held above 19°C during winter, but natural photoperiod delayed spawning for one month from February to March. The delayed spawning could be due to high winter temperatures inhibiting the initiation of gametogenesis.

Experiments conducted by Zanuy *et al.*, (1988) and Carrillo *et al.*, (1989) on sea bass showed that the rate of maturation and time of spawning could be modified by the use of light regimes. Exposing fish to one month of long days significantly advanced reproductive development compared to the control.

Sciaenids do not become sexually mature until they reach four to five years of age. Arnold *et al.*, (1976) showed that the fish can be brought to maturity when it is two year old by varying the temperature and photoperiod. The sciaenid broodstock was exposed to winter conditions (temperature 14-17°C, photoperiod 9 light: 15 dark regime) for two months. After this the photoperiod was changed to summer conditions (15 light: 9 dark regime) and the temperature was gradually raised to 26°C for a two month period. This treatment induced recrudescence and spawning commenced one month after the final temperature was reached in mid-April, which is close to the beginning of the natural spawning season.

Effects of long days and short days on Salmon

Salmon in the Northern Hemisphere spawn during autumn and winter months. Exposure of fish to short days during the first two to three months after spawning leads to a delay in the time of next spawning. The extent of the delay depends on the photoperiod applied and the time of natural spawning of the stock. Exposure of Salmon to long days followed by short days induces the fish to spawn at least three to four months early. This advance is thought to be the result of aggregate exposures to long days early and short days a little later in the cycle.

Bromage *et al.*, (1984) conducted experiment on rainbow trout to know the effect of light period on spawning time. Fishes, which were exposed to constant light and long days produced significant reduction in egg size and increase in relative fecundity. No other change was noticed as a result of these photoperiod manipulations.

It is important to note that no light is allowed to interrupt the artificial dark periods as even the shortest periods of illumination may influence the spawning time. Using photoperiod it is possible to spawn fish more than once in a year. In the case of Rainbow trout maintained under constant illumination period for one month before and after spawning it has been observed that the fish matures again after an interval of approximately six months. Similar results have also been reported in the case of flat fish.

Gillet (1991) conducted experiment to know the effect of temperature on Arctic charr by maintaining three stocks. In the first stock, 80 fishes were reared in water pumped from a depth of 36 meters. These fishes successfully spawned (100%) in mid January when the water temperature was close to 5°C. The water temperature fluctuated between 11 and 5.5°C. In the

second stock he reared 40 fishes in cold waters (5°C). A refrigeration system was used to maintain water temperature at 5±1°C. Majority of the females ovulated at the end of November. The first female spawned in mid October and 100% of the females had spawned in the beginning of January. In the third stock he maintained 20 fishes at 11°C. No ovulation was detected between December and March. Based on these results, he concluded that maintaining the stock at 5°C throughout the rearing period could advance the spawning time.

Photoperiod manipulation has been used to induce spawning in a number of other fishes including gilthead sea bream, *Sparus aurata* (Kadmon *et al.*, 1985) and milk fish, *Chanos chanos* (Lee and Weber, 1986). Some species even spawn in conjunction with a particular phase of the moon, as is the case with certain rabbit fishes. Another environmental parameter that has been thought to play a role in spawning of some species of fish is pressure.

Ornamental fishes originating in the Amazon river could be induced to spawn in the hatchery farms by reduction in pH and hardness of water chemically and by supplying abundant live food to the fishes.

Hossein (1987) conducted experiments on gold fish, which were reared in short photoperiod under a cool temperature, resulting in early maturation of gonads and spawning.

Conclusion

Of greater practical application for altering the rate of maturation and time of spawning is the use of temperature and photoperiod regimes. Carps were probably the first fish on which environmental control of spawning was practised. The use of environmental manipulation to induce spawning is a particularly attractive proposition for flat fish, sea bass, bream and mullet because the very fecundity of these fishes means that only small numbers of broodstock need to be maintained under artificial conditions.

Due to the increasing workload, hatchery managers adopt hypophysation technique for induce spawning instead of relying on natural production. As there is lot of hue and cry in respect of the residual limits of hormones, reproduction through environmental manipulation would no doubt be a sound solution and in fact, the only solution. The manipulation can be done by altering pH, temperature, salinity, etc. Lot of work has taken place in this area, and the species-wise results would have to be studied. The technology of environmental manipulation should be economical and adaptable in farm conditions.

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Polyculture - A Viable Alternative for Less Productive Tide-fed Brackishwater Ponds

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Polyculture of brackishwater fishes and shrimps was experimented upon in a tide-fed pond of 500 m² at Narakkal and it was found to be viable. Brackishwater fishes, ***Mugil cephalus, Liza parsia*** *and* ***Etroplus suratensis*** *along with shrimps,* ***Penaeus monodon*** *and* ***Penaeus indicus*** *were stocked at different stocking rates ranging from 3,800 to 12,000 nos/ha. A wet dough made out of mixture of varying ingredient compositions was given as feed @ 3.5 to 5% standing crop in feeding trays to the stocked animals. After a total culture duration of about 250 days, two crops of shrimp with a yield of 98.5 kg/ha were obtained. Fish production was 1571.3 kg/ha. Water quality parameters were also monitored and maintained regularly with application of lime, cattle dung and other inorganic fertilizers.*

The feeding habits, easy adaptation to varying salinities and availability of seed makes *M. cephalus, L. parsia* and *E. suratensis* suitable for polyculture in traditional tide-fed ponds along with *P. monodon* and/or *P. indicus*. Polyculture of mullets and shrimps are experimented upon in different culture conditions in India and abroad (James *et al.* 1984; Gonzales 1987; Pillai *et al* 1987; El Gobassy *et al.* 1993). Thampy *et al.* (1987) has reported *E. suratensis* as a suitable species for polyculture. In the present study, the authors have aimed at higher production from traditional ponds with comparatively higher rate of stocking. Survival and production of selected brackishwater fishes and shrimps in a short-term polyculture experiment were also determined.

Materials and Methods

The culture was carried out from July 1999 to March 2000 in a 500 m² tide- fed pond with a water depth of @ 0.65 to 1.1 m at Narakkal. For pond preparation, after dewatering, the pond bottom was treated with lime along with ammonium sulphate (4:1) which helped in the eradication of unwanted fishes and other organisms and also in the maintenance of soil pH. After keeping the sluice closed for five days, free entry of tidal water was allowed through fine mesh (1 mm) sluice screen. When algal bloom had developed to the extent needed, brackishwater fishes, *Mugil cephalus* (12,000 nos./ha), *L. parsia* (4,000 nos./ha) and *E. suratensis* (3,800 nos./ha) were collected from local seed sources and stocked. Post larvae of *P. monodon* (12,000 nos./ha) and *P. indicus* (12,000 nos./ha) produced at the hatcheries of CIBA at Chennai and Narakkal respectively were used for stocking. The stocking details are given in Table 1.

Table 1 : Stocking details of fishes and shrimps

Species	*M.cephalus*	*L.parsia*	*E.suratensis*	*P.monodon*	*P.indicus*
Date of Stocking	29-7-99	29-7-99	30-8-99	27-8-99 & 25-9-99	7-1-2000
Mean size at Stocking L/W; mm/g	25/0.16	25/0.16	58/8	23.3/0.3	15/0.3
Stocking Density (No/ha)	12,000	4,000	3,800	12,000	12,000

The pond was fertilized at regular intervals (once in a fortnight) with cattle dung and inorganic fertilizers (Urea, Factumphos and Ammonium Sulphate @ 1 : 1: 1) alternatively to induce algal bloom. Wet dough of feed mixture, consisting of ground nut cake (35%), rice bran (12%), coconut cake (10%), wheat bran (10%), fish meal (10%), Tapioca powder/ *maida* (10%) and vitamin mix (1%) was supplied to the stock once in a day @ 3 to 5% feeding trays. Physico-chemical parameters like temperature, pH, salinity, dissolved oxygen, water depth and total alkalinity were recorded at weekly intervals. Standard methods were followed for estimations. Fishes and shrimps were sampled once in a month, so that their

Table 2 : Sampling details showing growth measurements (length (mm)/weight (g)) of fishes and shrimps

Month	*M.cephalus*	*L.parsia*	*E.suratensis*	*P.monodon*	*P.indicus*
Aug'99	67.5/2.55	2.5/1.0	65/15	23.3/0.3	-
Sep	106.5/20	59.5/10	71/20	*	-
Oct	142.8/31	*	*	76-146/2.5-2.4	-
Nov	157/50	*	120/45	88-148/4-27	-
Dec	177/63	*	*	*	-
Jan '00	200/110	100/30	144/60	159/47	(Stocking)
Feb	226.5/128.5	*	*	*	*
Mar	250/154.5	161.6/35.6	178/134	152/28.8	100.7/5

*** Samples could not be secured**

Table 3 : Harvest details of fishes and shrimps

Species	*M.cephalus*	*L.parsia*	*E. suratensis*	*P.monodon*	*P.indicus*
Culture Duration (d)	250	250	215	130 & 190	84
Prodn (kg)	55.75	2.0	15.94	4.1	0.425
Yield (kg/ha)	1115	40	318.8	82	8.5
No. stocked	530	196	190	620	620
No recovered	367	52	133	194	84
Recovery rate (%)	69.24	26.54	70	32.33	14

growth rate could be observed and feeding quantity could be increased depending upon the standing crop biomass. For periphyton growth, polyethylene pieces tied to nylon wires were tied across the pond at regular intervals.

Results and Discussions

The monthly sampling details are given in Table 2. The pond was partially harvested for *P. monodon* after 130 days of stocking. After that *P. indicus* was stocked to have a second crop of shrimp. Total harvesting was done after 250 days of first stocking. A small percentage of *P. monodon* above 30 g size were observed to be soft due to the combined effect of low salinity, low pH, low dissolved oxygen and other undetermined abiotic or biotic factors in the ambient water. *P. indicus* did not have such a problem. In the light of this experience, it is recommended to stock the native species of the area for better culture results. The harvest details are given in Table 3. A total production of 1534 kg/ha was obtained. A production of 674 to 1321 kg/ha in 6 to 7 months of culture duration was reported by Mathew *et al* (1988) in polyculture trials. It is seen that from the weight of 0.16 g, each, *M. cephalus* reached @ 155 g, *L. parsia* @ 36 g and *E. suratensis* from 8 g to @ 134 g in 250 days with regular supplementary feeding. The initial size of *M. cephalus* influenced its harvest size as reported in an earlier work (Sarig 1975). As reported by him, the stocking size was 100 to 120 g. During the 250 days of culture period they could have attained 1000 g at least, a size which gives much higher profit to the farmer. For this to be achieved, however, the stocking rate has to be reduced considerably compared to the present rate. The size distribution of *M. cephalus, L. parsia* and *E. suratensis* were 220-278 mm/ 110-175 g, 140-187 mm/ 20-50 g and 163-187 mm/ 80-160 g respectively. In a 374 day polyculture experiment, Pillai *et al* (1987) had reported a yield of 141.54 kg/ha and a survival of 64.36% for *M. cephalus*. In the present study, a yield of 1115 kg/ha (69.24% recovery) was obtained. There was not much variation in size distribution for individual species in most of the fishes of the crop. In Mugilidae, it is a well-known fact that, in nature, *M. cephalus* grows faster than *L. parsia*, a smaller species. The stocking size of both species were the same, while only the growth rate of *L. parsia* was only about one fourth of that of *M. cephalus*. The highest recovery rate (70%) was obtained for *E. suratensis* and lowest for *P. indicus*. Lower recovery of *P. indicus* could be due to its later stocking which resulted in loss of small post-larvae in tidal exchange and in generating cannibalistic nature in them in the absence of suitable zooplankton organisms. These factors are to be taken care of when such trials are conducted in a similar way.

Table 4 : Mean water parameters in the polyculture pond

Month	*Temp (oC)*	*Salinity (ppt)*	*pH*	*DO (mg/l)*	*Tot. alkalinity (ppm)*	*Water depth (cm)*
Jul'99	31.5	8	8.5	6	107.5	57.5
Aug	32	8	8	5.45	107	57.5
Sep	32.5	10	7.25	1.6	97.5	62.5
Oct	31.5	7.5	7.05	2.45	55	82.5
Nov	31.5	9.5	7	3.15	60	87.5
Dec	31	16	6.7	1.7	55	95
Jan'00	31.5	17	7	1.85	65	95
Feb	32	21	6.65	2	72.5	87.5
Mar	32	22	6.6	1.85	72.5	87.5

The size distribution of *P. monodon* and *P. indicus* were 135 to 170 mm and 20 to 25 g and 94 to 108 mm and 5 to 6.5 g respectively. Nammalwar and Kathirvel (1988) reported 119.4 to 135.1 mm and 12.8 to 17.8 g for *P. monodon* in polyculture experiment. Rate of recovery was 20.6% to 35.3%. Pillai *et al*. (1987) got 34.6% survival for *P. monodon* in polyculture conducted in Sunderbans. In the present trial, 34.6% survival was noticed. It should be emphasized that no feed was supplied specifically for shrimps. Poor bloom conditions often prevailed in the culture pond due to black clam, *Villorita* sp. infestation.

Mean water quality parameters are given in Table 4. The values were normal except for dissolved oxygen and pH, which were less than normal on many occasions. James *et al* (1984) reported that mullets sharply reacted to low oxygen levels in polyculture ponds. But in the present study, no negative reaction due to low oxygen levels noticed.

The study has demonstrated that polyculture is a viable practice for extensive and semi-intensive traditional brackishwater culture systems, where monoculture of fish or shrimp is comparatively less yielding. Also it is observed that with proper stocking, feeding and fertilization, polyculture is a profitable alternative in tide fed ponds.

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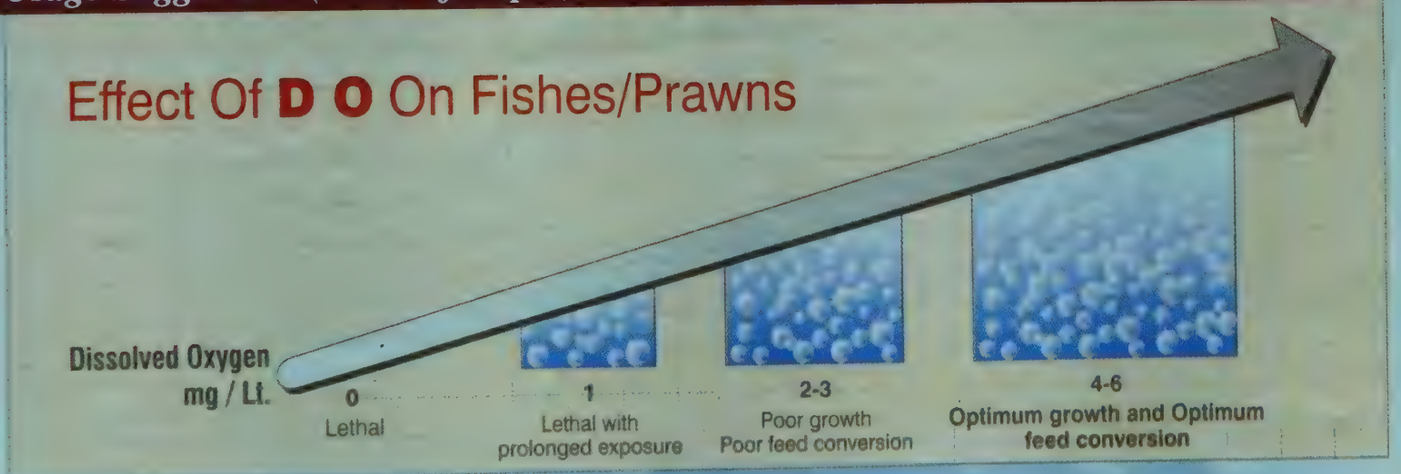

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India has extensive freshwater resources in the form of ponds, tanks, bheels, jheels, rivers, lakes and reservoirs. These resources harbour a wide and rich spectrum of native aquatic flora and fauna, governed by their zoogeographical locations. In view of the zoogeographical conditions, majority of the rivers in the country, however, inherently, do not hold the fast-growing commercially important fish species.

Tha lotic watersheets in the peninsular part of the country, represented by the east- and the west coast systems, flow through deep gorges, thick forests and, in certain cases, through inaccessible terrains. The fish and fisheries of these rivers are, save the deltaic region, as it is, poor. Comparatively, the significant difference in the rivers of the north and those of the peninsular India lies in the greater abundance of the Gangetic major carps in the former and their negligible presence in the latter which has naturally a bearing on the production of quality fish, their seed and ultimately on the potential.

There are a number of fast flowing rivers but of shorter lengths in the region from Maharashtra to Kerala along the west coast. The fish fauna in these, however, does not comprise large growing carps, though *Tor khudree*, *Hypselobarbus thomassi*, *H.pulchellus*, *H. curmuca*, *H.kolus* and *Labeo nigrescens* are variously recorded along with several lesser-known fish species. Large-growing catfishes, save *Wallago attu*, appear to be too few in these rivers.

In the present contribution, an attempt has been made to present the systematic account of fish species obtained during the survey of the river Bedthi/ Gangvalli. The need for such a checklist is of paramount importance from ichthyological considerations in particular, since very little work has been done on the piscine fauna of the west-flowing rivers of the State.

The Bedthi/Gangavalli River System

The river Bedthi (known as Gangavalli in the lower reaches), is one of the principal west-flowing rivers in the State. It is formed by the confluence of two streams - one by name Shalmala which has its origin near Someshwara temple, south of Dharwar and the other, Bedthi stream, originating in Hubli taluk. The two streams join near Kalghatgi to form Bedthi river which flows for about 25 km westwards and enters Uttara Kannada district and after a fairly straight south-west course of about 32 km, debouches into the sea south of river Kali nadi. Bedthi river flows for about 8 km south-east to the border of Uttara Kannada. Close to this border, the river flows for a length of 96 km (out of its total length of 161 km) without having any notable major feeder streams flowing into it. At the village of Magod, about 40 km from where it enters the district, the river dashes over the western face of the Sahyadris as a cataract known as 'Magod falls'. The Sonda river, one of its tributaries, joins it beyond Harrigadde village. About 15 km further, near the village Gundbala, it meets tidal waters and, for the remaining 24 km of its course, it is navigable.

The river basin lies between long 74° 17' 41" and 75° 10' 30" E and lat 14° 31' 37" and 15° 26' 53" N. The catchment area of the river is bounded by the watershed of Kali nadi in the north and, in the south, by the Aghanashini river. On the western side, it is bounded by Tungabhadra and Malaprabha catchments. The river drains a total area of 4405.6 sq.km.

The average rainfall of the area is 134 cm with a maximum of 492 cm and a minimum of 82 cm.

Geomorphology: Hard massive and dark phyllite, and quartzite is exposed in the entire river bed and upto EL 1300 - 1350 on the abutments. Above these elevations, the flanks are covered with thick residual soil. The rocks in the river bed are fine grained, dense and tough. The foliation is fairly well developed.

The rocks, chiefly consisting of quartz, plagioclase and green or brown biotite showing alterations to chlorite, calcite, magnetite and pyrite occur in subordinate amounts. The rocks may be termed as phyllitic-quartizites or quartz-chlorite schists.

Investigations and Results

The survey was conducted in different seasons of the year during 1994-'95 so as to collect, as far as possible, all the species of fish and to gather particulars of their occurrence in this river system. The fish samples were collected by operating castnets, gillnets and dragnets. Homogenity in the distribution of freshwater fish fauna, both below and above Magod falls was evident. However, the estuarine fish fauna listed was, more or less, confined to the area below the falls.

The freshwater fish species of the river, numbering 48, belong to 5 orders and 14 families. The estuarine fish species coming under 7 orders, 23 families and numbering 27, were observed from the catches as also from fish markets. The list of fish species of the reiver, compiled after the survey, is given in Table - 1. Of these, the commercially important fishes of genetic value observed are *T.khudree*, introduced Gangetic carps and herbivorous *H.pulchellus* [2-4].

Ichthyofauna of River Bedthi - Gangavalli, Uttara Kannada Karnataka

Order : Anguilliformes
Family : ANGUILLIDAE
Genus : *Anguilla* Schrank

1. *Anguilla bengalensis bengalensis* (Gray)

Order : Clupeiformes
Family : CLUPEIDAE
Subfamily : Dorsomatinae
Genus : *Anodontostoma* Bleeker

2. *Anodontostoma chacunda* (Hamilton-Buchanan)

Family : PRISTIGASTERIDAE
Genus : *Ilisha richardson*

3. Ilisha melastoma (Schneider)

Family : ENGRAULIDIDAE
Genus : Thryssa Cuvier

4. *Thryssa dussumieri* (Valenciennes)

Order : Cypriniformes
Family : CYPRINIDAE
Subfamily : Cyprininae
Genus : *Catla* Valenciennes

5. *Catla catla* (Hamilton-Buchanan)

Genus : *Cirrhinus* Cuvier

6. *Cirrhinus mrigala* (Hamilton-Buchanan)

7. *Cirrhinus reba* (Hamilton-Buchanan)

Genus : *Cyprinus* Linnaeus

8. *Cyprinus carpio var communis* Linnaeus

Genus : *Hypselobarbus* Bleeker

9. *Hypselobarbus kolus* (Sykes)

10. *Hypselobarbus pulchellus* (Day)

Genus : *Labeo* Cuvier

11. *Labeo bata* (Hamilton-Buchanan)

12. *Labeo calbasu* (Hamilton-Buchanan)

13. *Labeo fimbriatus* (Bloch)

14. *Labeo rohita* (Hamilton-Buchanan)

Genus : *Puntius* Hamilton - Buchanan

15. *Puntius amphibius* (Valenciennes)

16. *Puntius chola* (Hamilton-Buchanan)

17. *Puntius filamentosus* (Valenciennes)

18. *Puntius sarana sarana* (Hamilton-Buchanan)

19. *Puntius sophore* (Hamilton-Buchanan)

20. *Puntius puckelli* (Day)

Genus : *Tor* Gray

21. *Tor khudree* (Sykes)

22. *Tor mussulah* (Sykes)

Subfamily : Cultrinae
Genus : *Chela* Hamilton-Buchanan

23. *Chela cachius* (Hamilton-Buchanan)

Genus : *Salmostoma* Swainson

24. *Salmostoma acinaces* (Valenciennes)

25. *Salmostoma clupeoides* (Bloch)

26. *Salmostoma untrachi* (Day)

Subfamily : Rasborinae
Genus : *Amblypharyngodon* Bleeker

27. *Amblypharyngodon mola* (Hamilton-Buchanan)

Genus : *Danio* Hamilton - Buchanan

28. *Danio aequipinnatus* (McClelland)

Genus : *Esomus* Swainson

29. *Esmous denricus* (Hamilton-Buchanan)

Genus : *Parluciosoma* Howes

30. *Parluciosoma daniconius* (Hamilton-Buchanan)

Subfamily : Garrinae
Genus : *Garra* Hamilton - Buchanan

31. *Garra gotyla stenorhynchus (Jerdon)*

Family : BALITORIDAE
Subfamily : Nemacheilinae
Genus : *Nemacheilus* Bleeker

32. *Nemacheilus striatus* Day

Family : COBITIDAE
Subfamily : Cobitinae
Genus : *Lepidocephalus* Bleeker

33. *Lepidocephalus guntea* (Hamilton-Buchanan)

34. *Lepidocephalus thermalis* (Valenciennes)

Order : Siluriformes
Family : BAGRIDAE
Genus : *Mystus* scopoli

35. *Mystus cavasius* (Hamilton-Buchanan)

36. *Mystus gulio* (Hamilton-Buchanan)

37. *Mystus vittatus* (Bloch)

Family : SILURIDAE
Genus : *Ompok* Lacepede

38. *Ompok bimaculatus* (Bloch)

39. *Ompok malabaricus* (Valenciennes)

40. *Ompok pabo* (Hamilton-Buchanan)

Genus : Wallago Bleeker

41. *Wallago attu* (Schneider)

Family : CLARIDAE
Genus : *Clarias* Scopoli

42. *Clarias batrachus* (Linnaeus)

Family : ARIIDAE
: *Arius* Valenciennes

43. *Arius platystomus* Day

44. *Arius sona* (Hamilton-Buchanan)

Order : Cyprinodonotiformes
Suborder : Exocoetoidei
Family : HEMIRAMPHIDAE
Genus : *Zenorchopterus* Gill

45. *Zenorchopterus gilli* Smith

Family : BELONIDAE
Genus : *Strongylura van* Hasselt

46. Strongylura strongylura (Van Hasselt)

Genus : *Xenontodon* Regan

47. *Xenontodon cancila* (Hamilton-Buchanan

Order : Synbranchiformes
Family : SYNBRANCHIDAE
Genus : *Monopterus* Lacepede

48. *Monopterus (Amphipnous) cuchia* (Hamilton-Buchanan)

Order : Scorpaeniformes
Suborder : Platycephaloidei
Family : PLATYCEPHALIDAE
Genus : *Grommoplites* Fowler

49. *Grommoplites scaber* (Linnaeus)

Order : Perciformes
Suborder : Percoidei
Family : CENTROPOMIDAE
Genus : *Lates* Cuvier

50. *Lates calcarifer* (Bloch)

Family : AMBASSIDAE
Genus : *Ambassis* Cuvier

51. *Ambassis gymnocephalus* (Lacepede)

Genus : *Pseudambassis* Bleeker

52. *Pseudambassis ranga* (Hamilton-Buchanan)

Family : SERRANIDAE
Genus : *Epinephalus Bloch*

53. *Epinephalus malabaricus* (Schneider)

Family : SILLAGINIDAE
Genus : *Sillago* Cuvier

54. *Sillago sihama* (Forsskal)

Family : CARANGIDAE
Genus : *Caranx* Lacepede

55. *Caranx carangus* (Bloch)

Family : LUTJANIDAE
Genus : *Lutjanus* Bloch

56. *Lutjanus johni* (Bloch)

Family : GERREIDAE
Genus : *Gerreomorpha* Alleyne & Macleay

57. *Gerreomorpha setifer* (Hamilton-Buchanan)

Family : HAEMULIDAE
Genus : *Pomadasys* Lacepede

58. *Pomadasys argenteus* (Forsskal)

Family : SCIAENIDAE
Genus : *Otolithoides* Fowler

***59. Otolothoides biauritus* (Cantor)**

Genus : *Pama* Fowler

60. *Pama pama* (Hamilton-Buchanan)

Family : CICHLIDAE
Genus : *Etroplus* Cuvier

***61. Etroplus suratensis* (Bloch)**

Suborder : Mugiloidei
Family : MUGILIDAE
Genus : *Liza* Jordon & Swain

62. *Liza macrolepis* (Smith)

Genus : *Mugil* Linnaeus

63. *Mugil cephalus* (Linnaeus)

Genus : *Velamugil* Smith

64. *Velamugil cunnesius* (Valenciennes)

Suborder : Gobioidei
Family : GOBIIDAE
Subfamily : Gobiinae
Genus : *Glossogobius* Gill

65. *Glossogobius giuris* (Hamilton-Buchanan)

Subfamily : Apocryteinae
Genus : Boleopthalmus Valenciennes

66. *Boleopthalmus dussumieri* (Valenciennes)

Suborder : Channoidei
Family : CHANNIDAE
Genus : *Channa* Scopoli

***67. Channa marulius* (Hamilton-Buchanan)**

***68. Channa orientalis* (Bloch & Schneider)**

***69. Channa punctatus* (Bloch)**

***70. Channa striatus* (Bloch)**

Suborder : Mastacembeloidei
Family : MASTACEMBELIDAE
Genus : *Mastacembelus* Scopoli

***71. Mastacembelus armatus* (Lacepede)**

Order : Pleuronectiformes
Suborder : Pleuronectoidei
Family : BOTHIDAE
Subfamily : Paralichthyinae
Genus : *Pseudorhombus* Bleeker

***72. Pseudorhombus arius* (Hamilton-Buchanan)**

Suborder : Soleoidei
Family : CYNOGLOSSIDAE
Genus : *Cynoglossus* Hamilton - Buchanan

***73. Cynoglossus cynoglossus* (hamilton-Buchanan)**

74. Cynoglossus macrostomus Norman

Family : SOIEIDAE
Genus : Euryglossa Kemp

***75. Euryglossa orientalis* (Bloch & Schneider)**

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WSSV reported under control in Philippines

WSSV in cultured shrimp is reported to have been brought under control in Philippines, according to *Fish Farming International*. This development is attributed to the implementation of WSSV National Action Programme launched in March 2000. Under this programme PCR laboratories were set up at 10 centres, which has helped in the supply of WSSV-free shrimp PL to the hatcheries and consequential raising of white spot-free shrimp from the crop cycles of 2000.

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Fisheries Development in Union Territory of Pondicherry

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The Union Territory of Pondicherry consists of four regions viz., Pondicherry, Karaikal, Mahe and Yanam, with a coastline of 45 km. The first three regions are situated on the east coast and Mahe is situated on the Malabar coast.

Fisheries Department of the Union Territory was set up soon after the *defacto* merger of the four former French Territories with Indian Union (ie.1955), with the major objectives of augmenting marine and inland fish production and to improve the socio-economic conditions of the fisher community, through generation of employment opportunities. In pursuance of the above objectives, various production/welfare-oriented developmental schemes are being implemented.

There is a potential area of 1434.80 ha of inland water resources in the U.T. viz., lakes, tanks and ponds. Tanks and Ponds are owned by Panchayats/municipalities. There are aquaculture farms developed under Fish Farmers Development Agency programme. 800 ha. of brackishwater resources are available in Pondicherry, Karaikal and Yanam regions. Further, there is a continental shelf of 675 sq.km. with rich capture marine fishery resources.

With the objective of increasing the fish production from marine and inland water resources and improving the socio-economic status of fisherfolk of the Union Territory, various development/ welfare-oriented schemes are formulated and are being implemented placing greater emphasis on production-cum-employment oriented activities.

Fisheries have been recognised as a thrust area in the Union Territory of Pondicherry during successive Plan periods and especially during the Ninth Plan period. In 1999 - 2000 there was a total fish production of 42,830 t consisting of 38,620 t marine and 4210 t inland. The production target for 2000 - 2001 was 43,100 t, to consist of 4300 t of inland and 38,880 t of marine production.

Inland Fishery Development

The main objective of inland fisheries development is to augment the freshwater fish production in the available waterspread area in a responsible manner. The schemes implemented are :

Development of Freshwater Aquaculture: The objective of the scheme is to increase fish production by transferring the latest known technologies such as composite fish culture to fish farmers through planned extension service and to endeavour to maintain the Government owned farms as centres of excellence for emulation by farmers. The expenditure of Fish Farmers Development Agency is met out of State Plan Budget as grant-in-aid.

From 2000-2001 onwards it is proposed to grant Rs.1000/- per acre as subsidy towards cost of feed and Rs. 500/- per acre as subsidy towards seed purchased for fish culture.

Development of Brackishwater Aquaculture and Integrated Brackishwater farming: To develop brackishwater shrimp culture, an amount of Rs.40,000/- per ha. has been released as subsidy so far for the construction of brackishwater shrimp farms. It is also proposed to take up sea weed, mussel, pearl and oyster and crab culture programmes to increase production and to promote employment opportunities.

Information, Publicity and setting up of Aquarium/Ornamental fish breeding centre: It is proposed to create awareness among fishermen and others concerned on the latest technologies in the development of aquaculture and capture fisheries by conducting seminars, conferences, film shows, farmers' tours, farmers' meets etc. It is also proposed to establish and maintain marine and inland ornamental fish aquarium for the purpose of encouraging people to set up their own aquaria.

Marine Fisheries Development

There are 27 marine fishing villages with a population of about 43,495. Out of these 10,000 marine fishermen are actively engaged in fishing. At present around 500 mechanised boats and about 6000 traditional crafts are engaged in marine fishing.

Development of Marine fisheries through mechanisation: 20% subsidy at Rs. 1.60 lakhs and Rs. 0.60 lakhs has been granted to fishermen/prospective entrepreneurs for procurement of wooden mechanised boats with lengths upto 46 ft, and also FRP boats and Marine Plywood boats with nets by availing of institutional finance.

Assistance to small scale fishermen: Financial assistance to fishermen by way of providing 45% of the cost as loan and another 45% as subsidy, (with 10% as beneficiary contribution) has been granted for the procurement of crafts and tackles so as to promote their socio-economic status and to increase fish production. Further, programmes have been prepared to grant 50% subsidy for the procurement of FRP catamaran to enable fishermen to avail of loan for the balance of requirement from financial institutions.

Programme has also been drawn up to implement the scheme through Fishermen's co-operatives wherein the beneficiary will deposit 50% of the cost of FRP catamaran with a Society and the balance 50% subsidy to a maximum of Rs.25,000/- will be released to the Society and it in turn will deliver the FRP catamaran to the beneficiaries.

Service-cum-Maintenance Unit and provision of quick transport facilities to fishermen: The objective of the scheme is to supply essential engine spares at reasonable rates to mechanised boat operators, besides undertaking services, repairing of engines of mechanised boats/OBM owned by them. Periodical inspection of boats is also carried out by the service unit. The second component is aimed at providing quick transport facilities to fishermen by hiring out fish vans to Fishermen's Co-operative Societies who will transport the fish catches from the landing centres to marketing places before spoilage and in order to fetch better returns. The scheme provides for granting 33.33% subsidy subject to a maximum of Rs.30,000/- for purchase of auto goods carriers by societies/fishermen for the transport of fish. The loan has to be availed of from a commercial bank.

Reimbursement of sales tax on HSD oil: This scheme aims at reimbursing the sales tax on HSD oil used by mechanised boats below 20 m OAL and on OBM from 2000-01 onwards. The diesel will have to be procured from Co-op. Society/Federation/Corporation/Public Sector Agency outlets approved by State/Union Territory Government.

Fishermen's Welfare

In order to improve the socio-economic status of Fisher community, Union Territory of Pondicherry has implemented many welfare schemes.

Development of shorebased facilities, infrastructural facilities & setting up of iceplant-cum-cold storage: This scheme aims at providing shore-based facilities, infrastructural facilities and setting up of ice plant-cum-cold storage units in the coastal fishing villages. The constitution of the Fishing Harbour Development and Management Authority to look after maintenance and management of the Fishing Harbour after its completion at Pondicherry and Karaikal is part of this scheme. Fish landing jetty at Yanam is under construction.

Training of fishermen, fisherwomen and fisheries personnel: To disseminate technical know-how in fisheries technology, fisher youth are being deputed to various Central/State Training Institutes for undergoing training. Further, a short-term training programme is scheduled to be conducted for fishermen on post-harvest technology. It is also proposed to depute fisheries personnel for undergoing fisheries short term training programme on modern fisheries techniques at a training centre. It is also on the anvil to grant cash awards to meritorious students belonging to fishermen community who have secured the first two highest marks in SSLC/Matric and Higher Secondary classes.

Strengthening of Pondicherry State Fishermen Coop. Federation/Karaikal Fishermen Co-op. Marketing Union and Primary Fishermen Co-op. Societies: At present there are 38 Fishermen's Co-op. Societies in the Union Territory of Pondicherry with a membership of 28,754. To strengthen and for better functioning of the Primary Co-op. Societies, Pondicherry State Fishermen's Co-op. Federation, and Karaikal Fishermen's Co-op. Marketing Union, financial assistance is extended in the form of share capital contribution and loan for various purposes such as the purchase of site, construction of building and purchase of vehicle, as medium term loan/working capital and as furniture subsidy.

Supply of fishery requisites at subsidised rates: For effective and proper exploitation of fishery resources of marine and inland waters and to minimise the burden on fishermen for the procurement of fishery requisite like nets, ropes, floats, sinkers, nylon twine, fish containers, ice boxes and other requisites, 33 1/3% subsidy is granted by the Department and subsidy is being distributed through Fishermen's Co-operative Societies.

Interest subsidy to (a) fish vendors, (b) purchase of boats, OBM, catamaran, (c) Aquaculturists for loan obtained from commercial banks: Interest subsidy not exceeding 8% on loan amount obtained from Nationalised Banks for the activities relating to aquaculture, fish vending, purchase of catamaran, mech.boats, OBM and construction of houses by fishermen is granted by this Department.

Welfare scheme for fishermen Savings-cum-relief scheme: To extend financial assistance to fishermen during the lean months and also to inculcate saving habit, a sum of Rs.45 per month per person is collected from active inland fishermen who are members of Fishermen's Co-op. Societies for a period of 8 months in a year. A total amount of Rs.360/- thus collected will be matched with double the amount granted by Government. A total sum of Rs.1080/- will be disbursed to each fishermen during the four lean months equally at Rs.270/- each. Nearly 600 inland fishermen will be benefited.

Relief to fishermen during natural calamities: During natural calamities like cyclone, flood, fire, drought etc., assistance in the form of food, cloth, rice and other essential commodities is provided to fisher community. Financial assistance is also granted for loss of crafts/tackles/ loss of life during natural calamities/fire accident under the scheme.

Group Accident Insurance Scheme for Active Fisherwomen: This newly introduced scheme is being implemented from the year 2000-01. Under this scheme fisherwomen are insured against natural death/death due to accident. The Annual Premium for insurance is Rs.90.00, out of which Rs.10/- has to be borne by the fisherwomen and the remaining Rs.80.00 is borne by the Government. 50,000 fisherwomen are to be benefited under this scheme.

Fishermen's Co-operative Societies

The Co-operative Societies play an important role in the development of fisherfolk. At present, 38 Fishermen's Co-op. Societies with 28,754 members are functioning in the Union Territory of Pondicherry which include one Apex society, namely Pondicherry State Fishermen's Co-op Federation, one marketing society, known as Karaikal Fishermen Co-op. Marketing Union and 36 Primary Fishermen's Co-op. Societies. In order to create awareness among fisherwomen one Fisherwomen Co-op. Society was established at Mahe viz., "Priyadarshini Fisherwomen Co-op. Society". All the Fisherwomen members are actively engaged in fishing activities and other self-employment projects.

Centrally Sponsored Schemes

. Under a Centrally Sponsored Scheme known as "National Welfare for Fishermen" the following three components are implemented.

1. Development of Model Fishing Villages
2. Savings-cum-Relief scheme for Marine Fishermen
3. Group Accident Insurance Scheme for active fishermen

Development of model fishing villages: This scheme is being implemented from 1992-93. Under this scheme, a Grant-in-aid of Rs.35,000/- per house is released to the fishermen for construction of houses of 35 sq.m each. Government of India had released Grant-in-aid for 120 houses during Eighth Plan the details of which are as follows.

Kilinjalmedu : 20 houses; Karaikalmedu : 40 houses; Narambai : 30 houses; Pannithittu : 30 houses;

During Ninth Five Year Plan i.e., from 1997-98 onwards, Govt. of India has so far released grant for construction of 300 houses at Yanam. During the current year ie., 2000-01 Government of India has increased the grant to Rs.40,000/- per house.

In addition to the above, under State Plan Scheme "Housing and Colonisation for Fishermen", an amount of Rs.35,000/- is granted to each beneficiary fisherman for construction of a house. This pattern is being implemented since 1998-99 onwards. So far assistance for construction of 436 houses has been extended. During the year 2000-01 work has been taken up in respect of construction of 228 houses in the Union Territory of Pondicherry (Pondicherry - 150, Karaikal - 72, Mahe - 6 and Yanam - Nil). During this year an amount of Rs.10,000/- is granted to the fishermen for conversion of tiled houses into RCC roofed houses.

Savings-cum-relief scheme: This scheme is being been implemented since 1992-93. Under this scheme a monthly subscription of Rs.45/- is collected from eligible fishermen for a period of eight months. A total sum of Rs.360/- thus pooled up will be matched by a share double of this from the Government of India. A total of Rs.1,080/- will be disbursed to the fishermen during the four lean months at a rate of Rs.270/- per month. During 1999-2000, 10,100 fishermen were enrolled under this scheme and Government of India had released Rs.72.72 lakhs.

During 2000-2001 work has been taken up to enroll 10,500 fishermen under the scheme. During this year the pattern has been slightly modified. Subscription amount of Rs.75 is collected per fishermen for eight months and a total of Rs.600/- will be matched by an equal amount share by Government of India. Thus a total sum of Rs.1,200/- is planned to be disbursed during the four lean months at a rate of Rs.300/- per month.

Group Accident Insurance Scheme: This scheme has been implemented since 1983-84 onwards. Under this scheme active fishermen are insured for Rs.25,000/- against death/permanent disability and Rs.12,500/- for partial disability. A premium of Rs.11.25 is borne by the Government of India. During 1998-99 the insured amount was increased to Rs.35,000/-. A Premium of Rs.12/- is borne by the Government of India. During the year 2000-2001 this insured amount has been further increased to Rs.50,000/-, whereas the premium amount is Rs. 15/- only.

Fishing Harbours and Landing Facilities

Mechanised boats require safe anchorage during adverse weather conditions to land their catches, and for bunkering. Due to the absence of above facilities the mechanised boats face hardships during rainy seasons. Therefore, the construction of Fishing Harbours at Pondicherry and Karaikal has been taken up.

Construction of Fishing Harbour at Pondicherry: Government of India has sanctioned an amount of Rs.4.23 crores for the construction of Fishing Harbour at Thengaithittu, Pondicherry. So far, an amount of Rs.4.00 crores has been received from Government of India and an amount of Rs.3.00 crores had been spent for preliminary works. Tender for an amount of Rs.2.52 crores has been finalised for the major quay works viz., diaphragm wall, apron slab for quay, sloping hard, dredging etc., and work order awarded M/s. Traders and Engineers (P) Ltd., Calcutta on 6/10/1998. Additional amount is required to complete the project. Hence revised estimate for a sum of Rs.7.51 crores has been sent to Government of India for approval and for sanction of the balance of amount of Rs.3.28 crores.

Setting up of Fishing Harbour at Karaikal: It is also proposed to set up a mini-fishing harbour at Karaikal for which necessary techno-economic feasibility study had been conducted and a project report with an outlay of Rs.15.66 crores was prepared by Central Institute of Coastal Engineering for Fishery, Bangalore and submitted to Government of India. As suggested by CIFE, Bangalore, fresh physical and mathematical model studies and wave flume studies were carried out by Central Water and Power Research Station, Pune at a cost of Rs.12.96 lakhs and Hydrographic study by M/s. Secon Surveys, Bangalore at a cost of Rs.4.87 lakhs. The final report of Wave Flume studies received from CWPRS, Pune was sent to CICEF, Bangalore. Further action is in progress.

Fishing Harbour at Yanam: A fish landing jetty at a cost of Rs.70.00 lakhs was constructed during 1999-2000 at Savithri Nagar, Yanam under State grant. However, the fishermen of Yanam region are pressing the Administration to construct a pucca fishing harbour so as to land their catches hygienically and moor their boats safely. Hence it is planned to construct one mini-fishing harbour at Yanam under Centrally Sponsored Scheme and this is being followed up.

Conclusion

The objective of the Fisheries Department to augmenting fish production and improve socio-economic status of the fisherfolk is being progressively achieved by implementing the above schemes.

ICAR-ICLARM Meet on Research Collaboration

NBFGR, Lucknow : 12-13 April 2001

The ICAR - ICLARM Meet to identify areas for research collaboration between them was held at the National Bureau of Fish Genetic Resources, Lucknow from 12 to 13 April, 2001.

(Prior to this, a seven member ICLARM delegation headed by Dr. Meryl J. William, Director General, which included Deputy Director General, Director, International Relations and four Programme Leaders met with Dr. R.S. Paroda, Director General, ICAR and Dr. K. Gopakumar, Deputy Director General (Fisheries) and his staff on 11th April at ICAR's Headquarters in New Delhi).

Dr. Paroda welcoming Dr. Meryl J. William and other members, recalled the research collaboration ICAR was having with CGIAR institutions. Dr. Paroda expressed hope that the meeting would lead to identification of areas for further strengthening research collaboration between ICAR and ICLARM. He added that capture fisheries and aquaculture were the two growing sub-sectors of fisheries of India and that ICAR laid emphasis on the sustainable management of these.

ICLARM delegation held discussions with the ICAR team led by Dr. K. Gopakumar, Deputy Director General (Fisheries). The other members of the team were Dr. B.N.Singh, Assistant Director General (Inland Fy.), Directors of ICAR fisheries institutes, Director, NCAP and other scientists from fisheries institutes.

Dr. Gopakumar welcomed the delegation and briefly outlined the objectives of the meeting. Meryl J. William in her opening remarks indicated the importance ICLARM gave in involving countries like India in its overall programme.

The Directors/representatives of participating ICAR institutes presented achievements of their institutes, ongoing and future programmes as well as areas for research collaboration.

Dr.K. Gopakumar summarized six potential areas from ICAR side for collaboration : 1) Improvement of genetic base of carps by continuation of ongoing collaborative programme, 2) Collaborative project on Trawlbase, 3) DNA Fingerprinting and identifying genetic markers of improved stocks, 4) Conservation of coral reef fisheries, mariculture and culture of seaweeds, 5) Socio-economic evaluation as a factor for advising on improvements in fishery policies including post-harvest practices, and 6) Updating and improving of database developed by NBFGR, CIFRI and CMFRI.

Participants at the ICAR - ICLARM Meet

Dr. A.G. Ponniah, Director, NBFGR, explaining a point during The Meet chaired by Dr. K. Gopakumar, DDG (Fy.), ICAR

Meryl J. William said that the large infrastructure and the strong base for the fisheries research in India were assets of immense value and desired for an enhanced collaboration between ICLARM and ICAR in the coming years. She appreciated the suggestion of Gopakumar to enlarge the scope of ICLARM's mandate to accommodate emerging areas that have strong socio-economic relevance to developing countries.

Dr. Peter R. Gardiner, Deputy Director General, ICLARM emphasized areas of collaboration. Detailed discussions were held on each of the identified areas.

Dr. A.G. Ponniah, Director, NBFGR, proposed the evaluation of the life history traits of the transgenic fish and their impact on native stocks which would help in taking a decision regarding their clearance from ecological point of view. He indicated interest in having a collaborative programme with ICLARM for developing methodologies for the ecological evaluation of the exotic species in open water and culture systems.

Ponniah also suggested restructuring of the FishBase - a database developed by the ICLARM to enable effective utilization of data by large countries like India and China. In this connection he observed that NBFGR would be in a position to generate primary information and develop database through two NATP projects in which 12 coordinating centres and four ICAR institutes were participating.

Dr. M.V. Gupta, Director, International Relations, ICLARM assured help to the extent possible from ICLARM in the development of national databases by ICAR institutes.

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Prospects of Giant River Catfish (*Aorichthys seenghala*) Culture

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Fish, being a high protein food, can go a long way to supplement the nutritional demands of unabatedly growing population of India. Though the annual fish production of our country has reached 5 million ton mark from 0.75 million tons in sixties during the last four decades, yet a wide demand and supply gap exists. Therefore, it is essential to explore new exploitable avenues for augmenting fish production of our country. Fortunately, India is endowed with one of the richest genetic fish diversity and its inland fisheries resources are many and varied. Further, due to cultural differences and diverse food habits of our countrymen, different species of fishes are preferred as food in different regions of the country. Thus, there exists great scope for adding new component species in traditional aquaculture, practices for achieving enhanced fish production and improved economic returns.

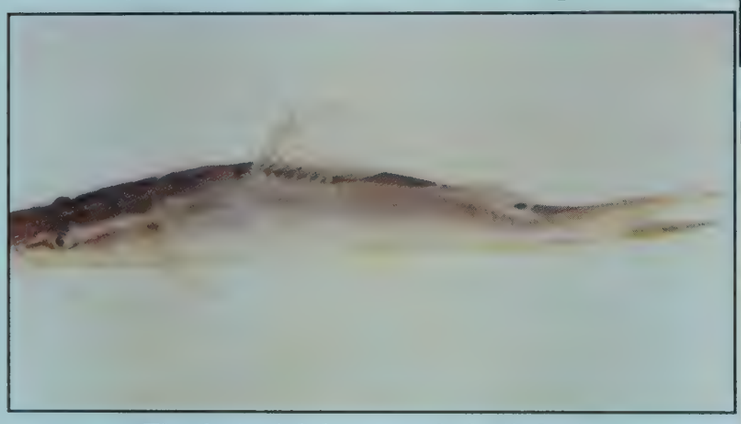

Fig. 1. *Aorichthys seenghala* (Sykes).

Fig. 2. Sexual dimorphism in *A.seenghala*

Fig. 3. Young ones of *A.seenghala* Scooped from nest.

Fig 4. Laboratory reared *A.seenghala* for varying periods.

Large-sized catfishes are in great demand in north and north-western states as they attract high consumer preference. In many countries of the world catfishes are farmed on industrial scale viz., U.S.A, Thailand, Cambodia, Malaysia, etc. but the importance of such an effort in India has been realised somewhat late, though the Indian sub-continent harbours 142 species of catfishes belonging to 13 families and 43 genera (Jayaram, 1977). Of these, *Wallago attu*, *Aorichthys seenghala*, *A.aor*, *Pangasius pangasius*, and *Silondia silondia*, known to attain large size, are available for culture. Out of these species, *A.seenghala* enjoys high commercial status and is preferred as food fish even over carp fishes due to its excellent flesh quality and flavour, particularly in Punjab, Haryana, Delhi and Himachal Pradesh. There is an urgent need to develop suitable methods for bringing this prized catfish of India under the umbrella of aquaculture. It is in this context, investigations were made around Allahabad, the results of which are summarized in this communication.

Distribution: *Aorichthys seenghala* is widely distributed in Punjab, Delhi, Uttar Pradesh and Bihar in the rivers Ganga and Yamuna, in West Bengal, Assam, Bangla Desh and Myanmar. In the south it extends upto Krishna river and its tributaries.

Common names: The fish is commonly known as Giant River Catfish. The names by which the fish is known in the various States of India are given hereunder:

Assam	- Auri, Arii, Aor
West Bengal	- Arr-tengara, Air, Guji
Bihar	- Gagri, Tengara
Uttar Pradesh	- Tengara, Tengra, Seenghala, Singara
Punjab	- Singoa, Tengara
Orissa	- Katrang, Alli, Addi
Andhra Pradesh	- Nare-jella
Tamilnadu	- Pona keluthi, Naddu kelunthi
Kerala	- Karatt, Karadu
Karnataka	- Bilisurage-meena
Maharashtra	- Singhala, Shingta

Fisheries: The commercial catches of *A.seenghala* mainly come from rivers. It forms a sizeable fishery of Ganga river system. In yester years the two species of *Aorichthys* i.e. *A.seenghala* and *A.aor* contributed significantly to the commercial catches and they ranked next to carps. Recently the diminishing fishery of hilsa and alarming trends of catches of gangetic carps have shifted the fishery exploitation concentration towards fishes of other commercial value, particularly the catfishes that grow to a large size. Gupta and Tyagi, (1992) have cautioned about overfishing of *A.seeghala* population of river Ganga. Further evidence of declined commercial catches of this species, particularly in the share of *A.seenghala* in riverine catches has been demonstrated by Seth and Katiha, 1999. They observed that the recent shift in the use of fishing gears and increase in fishing intensity around the breeding grounds of the fish were evident indicators of fishing stress on the stocks of the fish. A strong seasonality was observed by them in the fisheries of *A.seenghala* over the years. The wanton killing of its population during early part of breeding season (pre-monsoon) and juveniles in postmonsoon months are attributed to the decline in its catches. These fishing practices have been threatening the fishery and it needs greater attention for its revival.

Culture Management

The aquaculture management of *A.seenghala* calls for an indepth understanding of environmental conditions related to habitat, breeding and parental care, seed resource and rearing of its juveniles to stocking size for subsequent culture upto table size in captive environment.

Investigations made is these directions are briefly summarized under the following heads.

(a) Sexual dimorphism: Seth and Mandal, 1999 have dealt with in detail on sexual dimorphisim in *A.seenghala*. According to them sexes in mature *A.seenghala* can easily be identified by the difference in their external morphological character. The male *A.seenghala* grows to 350 mm and over in length and have a muscular, conical reddish pink papilla just above the genital opening. It becomes prominent by acquiring a stout musculature of reddish tinge during the onset of breeding season i.e. March-July. A scrutiny of juvenile catches showed that the immature *A.seenghala* below 350 mm in length lacked such papilla. The papilla was also not observed in the mature females of the species.

The gradual change in the (Shining silver gray) colour of skin also helped in the identification of male fish during breeding season. Appearance of white creamy secretion, locally known as '*Chara*' on the ventral surface of the male fish distinguished it as the nest-guarding male and confirmed the commencement of breeding.

(b) Breeding behaviour and parental care: *A.seenghala* is known to exhibit the phenomenon of parental care. Certain aspects of parental behaviour of the fish have been studied by Raj, 1940, 1962; Saigal and Motwani, 1961; Ranganathan and Radha, 1966 and Seth, 1977. These studies revealed the fish to be monoparental guarder of the nest. The male selects soft sandy bottom of the river and excavates it with great care and caution. The young ones which are housed in the nest are nursed and fed over the body secretion of the male parent guarding the nest till they attain a size range of 40-45 mm.

Detailed observations on the rhythmic breeding behaviour of the fish viz., in respect of pre-nest building, nest building, courtships, egg laying, hatching and nesting have been given (Seth, 1977; Seth and Katiha, 1999 and Seth, 1977). Mature *A.seenghala* start migrating to favourable zones of the river (nesting sites) for construction of nests with rise in temperature during March-April. The nesting sites in riverine conditions are characterised by feeble current, shallow depth and presence of aquatic weed. The fish prefers soft, sandy, clear and clean bottom for constructing its nests. Biological studies of the fish (Saigal and Motwani, 1961) have indicated that it breeds in spurts. The dispersal of young ones of seenghala which are otherwise housed in nests coincides with monsoon floods in the river.

c) Major Constraint in Culture: The habit of the male fish to take care of the young ones particularly in respect of feeding, has a direct critical impact on the survival of the young ones in captive environment and this is considered as a major constraint in the production of seed of this fish. The problem becomes further complex due to the habit of the fish to breed intermittently. A recent attempt made by Gupta *et al.*, (1993) to induce the fish to breed through hypophysation and rearing the early fry on artificial feed met with failure. Inability to produce the seed thus has been considered as a major problem towards evolving a viable technology to culture this fish.

d) Seed Production: Rivers offer immense scope for the collection of young ones

of gaint catfish from their natural abode - the nest. Hence it was considered convenient to collect seed from the nests in order to solve the problem of producing the stocking material of the fish, taking care of the problem of change from riverine habitat to captive environment. With this new approach the fry of seenghala were successfully collected from river Ganga and reared to stocking size (75-105 mm) for the first time for subsequent culture in a village pond near Allahabad. The technology is well suited for Indian fish farmers, fishers and others interested too.

e) Culture Experiment: Fry of *A. seenghala* under parental care (average size 20 mm) collected from nests from river Ganga around Allahabad were successfully reared (Av. size 75-105 mm), fed on semi-boiled trash fish in 1/12" mesh nylon cages (1:1:1 m) kept afloat in running water of the river for a period of 30 days. The fingerlings thus produced were later stocked in a prepared pond at the rate of 10,000 nos per ha. The fish attained an average size of 518 mm (Av.wt. 717 g) in about 20 months of culture period with 80% survival, indicating that the fish thrives well in the pond culture system. Forage fishes, *A.mola, P.ticto, P.sophore, O.bacaila* and *A.rang*a introduced in the pond prior to stocking of seenghala fingerlings served as food for them.

f) Economic relevance: The breeding of *A.seenghala* extends from March/April to July/August in river Ganga. These hard summer months are considered as lean months for agriculture. Collection of seenghala young ones from nests and raising them in small water impoundments offers immense scope for self employment to agriculturists and the activity does not require any scientific inputs. The culture, even in a small pond, will not only add to the existing fish production but will also serve as an extra source of income to them. It will also help in putting and end to wanton killing of male broodfish guarding the nest , thereby facilitating conservation of the natural stock of the fish.

Conclusion

The success achieved in producing the seed of *A.seenghala* and their culture subsequently in ponds paves the way for refining the technologies for transfer to the farmers and other entrepreneurs, which will eventually lead to a flourishing catfish culture industry in the country.

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Fishery Survey of India Recognised as Research Centre

The Board of Research Studies and Principal, College of Science and Technology,' Andhra University has accorded recognition to the Fishery Survey of India (FSI), Mumbai and its unit at Visakhapatnam as Centres of Research leading to M.Phil and Ph.D. Degree of Andhra University.

Awards to Scientists of CIFE, Mumbai

Mr. S.R. Sharif and Dr.K. Pani Prasad, Scientist's won a cash prize of 200 UK pounds for their article on Tools for Disease Diagnosis in fish which was published in Fish Farmer International Magazine.

Mr. Dasari Bhoomiah, Technical Officer and Mrs. Angha Joshi, Junior clerk were awarded a letter of appreciation by the Indian Fisheries Association (IFA) for their contributions to designing and digital imaging of Publications of IFA.

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Gender Bias in Fishery Literature

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Salt Lake City, Kolkata - 91

This article has been written on an objective premise, without even trying to give a proper focus to the term 'women engaged in fishing' in fishery literature. I have to admit that, like other female fishery scientists, I am of the view that women's role in fisheries is very significant and that there is gender bias in respect of the workers. But, I wonder why this simple issue of gender bias in fishery literature has not been so far discussed effectively so far by female fishery scientists.

As the title says, this article is about the gender bias in the fishery literature and it is more importantly related to the female part. The word History itself stands out and says that it is always 'His Story' and comparatively only a few of the times 'Her Story'. Is it probably because of so called male dominated society or should I rather use the word Kingdom and wonder for the usage of History of mankind. Without getting into the details of this, I may say that the issue discussed over here is about the very common practice of gender bias in the fishery related literature. Sometimes without any deliberate reason, it is so much ingrained in the whole system that it has just become a way of expressing thoughts, observations and views. In most of the literature, it is found that the use of 'Fisherman' or the plural of the same is prevalent. Here, I have to concede that there are dissertations and some literature on 'Women in Fisheries'. In these, the role of women in fisheries is highlighted. This may be construed as bias towards women but these publications are limited and an exception.

It does not call for any sort of content analysis in terms of statistics to show that this bias (more so) exists in the use of the word 'fisherman' in the fishery literature (Are they male authored?). One can find it almost everywhere.

It is true that in some of the publications of recent origin this bias is not there and the use of words like fishers, fisherfolk, fishfolk are being usually used. The point is: why all publications cannot do this and why is it that only a female scientist has to ponder on this?

I am reminded by some people (men of course) that the fact is, role of men in fishery is more and... that men in fisheries have so much of heavy workload and work under loads of pressure. Kohli *et al* (1998) have reported that all type of fishing in seas and open inland waters are done by men only. The various gears used require robustness, toughness and operational endurance and therefore suitable only for fishermen. However, he states that in some parts of India, specially in North eastern states of Assam and Manipur one can see tribal women engaged in fishing activities specially in flood plains, inundated low forest lands and marginal areas of canals and rivers. But when women are engaged in fishing, it is stated that the gears used are light ones like hand-operated Chinese type dip nets operated by one person or a variety of traps and other hand devices for catching fishes in shallow waters.

All this emphasises the need of performing systematic studies of measurement of their workload. The work of men fishers is indeed heavy... but what of the work of women fishers! The work done by them is in no way light. No one who is engaged in fishery research should say that their work is not important. Their work is endless and I want to stress that their work is in no way menial. If the work of men fishers is heavy there is a lack of literature quoting some objective studies to support it. But the issue here is not of comparing the workloads of both the sexes and thus coming to a conclusion that one of the sexes work more... and even if one concludes that either one of the sexes work more it does not necessarily mean that the word 'Fishermen' can be used to depict both the sexes.

For the gender bias in fishery literature, the reason usually given, though the reason is in no way of any strength, is that generally women fishers do not go inside the water or on the boat for fishing. Does that mean that the only persons who go for fishing in the sea are actively engaged in fishing and rest are not. Does this in turn mean that the labourers employed by the fish owners of the boat are active fishers and rest are not. The irony is that the labourers employed on the boat are just called labourers and not fishers.

But this in no way establishes that the role of people who do not go out to the sea is negligible. Why is the work done by a women in fisheries regarded as a part time work? In fact, they are engaged for much more human hours of the day and only because they do not go inside the water or on the boat for fishing, it does not necessarily mean that their role is less important. Kohli *et al* (1998) have stated that the post harvest activities in fishing are supplementary in nature but nevertheless very important. It is known that the involvement of women is appreciably good in these activities which are called supplementary and ancillary because of their nature or because they are performed by women. In Gujarat, it has been reported by Sehara (1998) that the owners of boats do not join the crew for fishing as they find themselves engaged in management of shore-based work related to input supply and marketing of fish. But fishery scientists will not say that the boat owners are not fisherfolk or active fisherfolk. Are they included as active fisherfolk and get all the benefits only because they are men and / men who own boats?

Women in fisheries are not to be treated as part-time workers. As a researcher I would say that studies are needed to reveal that in terms of hours invested, workload and economic returns

and various other parameters their contribution is very significant. This I feel is necessary to give an objective basis to the fishery literature. Though, personally, I feel that these studies should not be done only to prove this particular point.

It seems that it is viewed that the work of women engaged in fishing is merely an extention of domestic work. But this is not true. Domestic work, as such, is of prime importance and significance and the fisheries related work is not an extension to it but is in addition to it. Women are productive members of the community and the society. Is it that the work is undervalued becuse it is performed by women and when these roles would have been performed by men , they would be called as significant jobs?

It has to be pointed out here that I am against the view to analyse a certain role only within the framework of economics. Though this is a necessary point, I hold the view that there is a need to get away from analyzing this only from economic significance of gender issues. The tendency for the analysis of gender relations to be conducted solely in the context of the economic sphere does not seem to be correct. This is the reason that this has not been included here.

It is high time we realized that the issue is not to be argued but it is as simple as using fishers/fisherfolk/fishfolk in the literature. There is no justification to categorise fisherwomen separately.

This article has not been written with a view emphasising feministic idealism, though, at certain places readers might be provoked to think that way but the intention is not so. It is written just to highlight again that women in fisheries are a very important occupational group and development projects should be made in accordance to the needs of women. It is necessary that they should be given proper focus in the fishery literature by the scientific community and those engaged in fishery development.

This is no longer a gender issue but a potential human resource issue as the development of human resource is of prime importance. It has been reported that 'women are one half of the adult population and one third of the official labour force, they perform two thirds of the world's working hours, earn one tenth of the income and own 1% of world's property, according to World Conference of the UN Decade for women.

On a lighter note this article is being concluded by adding (but this issue is in no way to be taken lightly) that there is some relief that the word 'Fishermen/women' is not male biased like the expression 'men/women'. At least for a change the expression 'fishermen/women has a hint of feminism.

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Visiting Scientist Assignment To B.K. Padhi in Canada

Dr. B.K. Padhi, the noted fish geneticist and author of the book `***APPLIED* FISH GENETICS**' is now a visiting scientist at Ottawa Health Research Institute, Ottawa, Canada. He is invloved in genetic research of Zebrafish, which is now a favourite model organism for gene function analysis in vertebrates including man. The technical approach for this study involves gene expression analysis using different ESTs (Expressed Sequence Tags) libraries on the whole mount fish embryo. ESTs are complementary DNAs (cDNAs) which are sequenced at their 5'and 3' termini. These are used as the probe for analysing gene expression *in situ* by molecular hybridization. This approach is more useful for analysing gene function during vertebrate development. Here, Zebrafish beats mouse as a model organism for its ability to produce embryos that develop outside the mother's body and transparent appearance for which the developing organs can be seen easily under a light microscope. On the contary, the mouse embryos develop within the mother's womb and the developmental sequences are difficult to trace. Further, Zebrafish can be bred easily in the laboratory throughout the year. Gene function analysis using Zebrafish as a model is more significant now after the completion of genome sequnce in man. This will benefit the human hereditary disease diagnosis and therapy of diseased genes in coming years.

Dr. Padhi is also working on cloning and characterization of genes that are induced during fin regereation. By subtractive hybridization of the cDNA of the normal fin and the regenerated fin, he is in the process of picking up the genes which are up-regulated during regeneration process. This regeneration study as a whole has enoromous potential in tissue engineering, organ transplantation and wound healing therapy.

Dr. Padhi treats this assignment as a boon and a moral booster to his long term goal of developing useful technology for fish genetic diversity conservation and productivity enhancement. He believes that his current research experience will equip him to develop a novel technology for producing genetically sterile fish with high growth rate. One of the major threat to fish genetic diversity is the gene pool contamination and homogenisation due to inter-breeding of different stocks as a result of irrational/unthoughtful stock transfer and transplantation. Thus, curbing of the fertility will avoid the threat of gene pool contamination by inter-breeding while fish productivity enhanced by artificial recruitment. Let us hope that Dr.Padhi's mission comes to reality for the benefit of the fisheries wealth conservation in India.

Dr.Padhi also visited the Zebrafish laboratory of IGBMC, Straousbourg, France in August 2000. He may be contacted by e.mail: padhibk@yahoo.com or by post: Dr. Bhaja K. Padhi, Ottawa Health Research Institute, 725 Parkdale Avenue, Ottawa, On, Canada.

1999 World Fish Catch 92.86 mill t : FAO

Global fish catch in 1999 peaked back to 92.86 million tonnes to make up for the fall in the year before due to the devastating effects *El Nino* on industrial fisheries of the Pacific and foodfish stocks, says a report in *Fishing News Inernational*.

Figures of FAO are reported by *FNI* as showing that the world's catch of fish, crustaceans and molluscs from marine and inland waters rose 6.83 per cent in 1999, which is close on the 93.61 million tonne figure recorded in 1987. India has maintained its 8th position in 1999 too with a catch of 3.317 million t compared to 3.215 million t in 1998. Increase in catches has been achieved by Viet nam, Bangladesh, Pakistan and South Africa.

China remains the top global fishing nation with a catch of 17.24 million tonnes, but it is reported that this is now static as the country has shifted its concentration towards farmed species to feed its teeming population. The country is believed to be producing a total farmed and capture fish output of around 40 million tonnes a year, although FAO has yet to declare the country's fish farming production figures for 1999, *FNI* says.

Peru leapt back to the second position among marine fishing nations in 1999 with a catch of 8.42 million tonnes (a phenomenal 94 per cent increase from to fifth place the year before).

Japan's catch fell by a marginal 1.65 per cent in 1999, but the harvest continued in five million t range.

Chile also has come into focus, with a spurt of 54 per cent in its catch of 5 million t in 1999.

The US catches have a marginal rise to 4.74 million t, while Indonesia crossed the four million tonne barrier. Its catch rose by 4.65 per cent to reach 4.14 million t.

Morocco's landings went up by 4.93 per cent in 1999 to 745,431 tonnes to put the country in 25th position. However, with the EU having failed to pull off a new fishing deal for some 500 vessels from Spain and Portugal, the country is getting set to see its landings rise significantly, FNI reports.

World Catch : 1999

	1998 (mt)	*1999 (mt)*	*Increase/ decrease*
Total capture production	86,933,121	92,866,553	+6.83%
Marine waters	78,984,128	84,606,398	+7.12%
Inland waters	7,948,993	8,260,155	+3.91%

Top 30 producing countries

Country	*1998 (mt)*	*1999 (mt)*	*Difference*
1. China	17,229,927	17,240,032	+0.06%
2. Peru	4,338,437	8,429,290	+94.29%
3. Japan	5,263,384	5,176,460	-1.65%
4. Chile	3,265,383	5,050,528	+54.67%
5. USA	4,708,980	4,749,645	+0.86%
6. Indonesia	3,964,897	4,149,420	+4.65%
7. Russian Fed	4,454,759	4,141,157	-7.04%
8. India	3,214,765	3,316,815	+3.17%
9. Thailand	2,900,320	3,004,900	+3.61%
10. Norway	2,850,565	2,620,073	-8.09%
11. Korea Rep	2,026,934	2,119,668	+4.58%
12. Philippines	1,833,458	1,870,450	+2.02%
13. Iceland	1,681,951	1,736,267	+3.23%
14. Denmark	1,557,335	1,405,011	-9.78%
15. Malaysia	1,153,719	1,251,768	+8.50%
16. Mexico	1,174,742	1,202,178	+2.34%
17. Viet Nam	1,130,660	1,200,000	+6.13%
18. Spain	1,215,645	1,167,242	-3.98%
19. China Taiwan	1,091,768	1,099,715	+0.73%
20. Argentina	1,128,689	1,024,804	-9.20%
21. Canada	1,013,747	1,021,916	0.81%
22. Bangladesh	839,141	924,056	+10.12%
23. Myanmar	872,971	851,581	-2.45%
24. UK	920,355	837,759	-8.97%
25. Morocco	710,436	745,431	+4.93%
26. Brazil	706,789	655,000	-7.33%
27. Pakistan	596,980	654,530	+9.64%
28. New Zealand	636,219	594,084	-6.62%
29. South Africa	558,857	588,001	+5.21%
30. France	548,764	578,071	+5.34%

Source : *Fishing News International* : May 2001

Species over 300,000 tonnes in 1999

Scientific name	*FAO English name*	*1998(mt)*	*1999(mt)*	*Difference*
1. *Engraulis ringens*	Anchoveta (Peruvian anchovy)	1,729,064	8,723,265	+404.51%
2. *Theragra chalcogramma*	Alaska pollock (Walleye poll.)	4,049,223	3,362,473	-16.96%
3. *Clupea harengus*	Atlantic herring	2,421,859	2,403,543	-0.76%
4. *Katsuwonus pelamis*	Skipjack tuna	1,883,541	1,976,479	+4.93%
5. *Scomber japonicus*	Chub mackerel	1,924,307	1,955,053	+1.60%
6. *Engraulis japonicus*	Japanese anchovy	2,093,888	1,820,259	-13.07%
7. *Trachurus murphyi*	Chilean jack mackerel	2,025,758	1,423,447	-29.73%
8. *Trichiurus lepturus*	Largehead hairtail	1,435,406	1,418,944	-1.15%
9. *Micromesistius poutassou*	Blue whiting (Poutassou)	1,185,463	1,323,167	+11.62%
10. *Thunnus albacares*	Yellowfin tuna	1,252,495	1,258,386	+0.47%
11. *Gadus morhua*	Atlantic cod	1,213,447	1,092,859	-9.94%
12. *Illex argentinus*	Argentine shortfin squid	664,719	1,091,299	+64.17%
13. *Mallotus vilosus*	Capelin	985,498	904,840	-8.18%
14. *Sardina pilchardus*	European pilchard (Sardine)	941,188	901,427	-4.22%
15. *Strangomera bentincki*	Araucanian herring	317,564	782,142	+146.29%
16. *Brevoortia patronus*	Gulf menhaden	497,461	694,242	+39.56%
17. *Sprattus sprattus*	European sprat	696,228	684,164	-1.73%
18. *Scomber scombrus*	Atlantic mackerel	667,771	610,947	-8.51%
19. *Acetes japonicus*	Akiami paste shrimp	587,376	598,602	+1.91%
20. *Engraulis encrasicolus*	European anchovy	499,349	598,438	+19.84%
21. *Scomberomorus niphonius*	Japanese Spanish mackerel	551,780	595,103	+7.85%
22. *Sardinops melanostictus*	Japanese pilchard	295,788	515,477	+74.27%
23. *Todarodes pacificus*	Japanese flying squid	378,605	497,887	+31.51%
24. *Sardinella aurita*	Round sardinella	670,556	480,508	-28.34%
25. *Clupea pallasii*	Pacific herring	508,627	471,860	-7.23%
26. *Macruronus magellanicus*	Patagonian grenadier	472,784	446,663	-5.52%
27. *Sardinops sagax*	South American pilchard	937,269	442,690	-52.77%
28. *Trachypenaeus curvirostris*	Southern rough shrimp	179,544	403,027	+124.47%
29. *Gadus macrocephalus*	Pacific cod	411,371	402,244	-2.22%
30. *Thunnus obesus*	Bigeye tuna	381,547	399,628	+4.74%
31. *Oncorhynchus gorbuscha*	Pink(humpback) salmon	371,552	386,900	+4.13%
32. *Sardinops caeruleus*	California pilchard	365,806	374,314	+2.33%
33. *Merluccius hubbsi*	Argentine hake	527,229	372,039	-29.44%
34. *Pollachius virens*	Saithe (Pollock)	331,378	339,987	+2.60%
35. *Pandalus borealis*	Northern prawn	314,022	338,969	+7.94%
36. *Larimichthys polyactis*	Yellow croaker	278,807	323,564	+16.05%
37. *Trachurus trachurus*	Atlantic horse mackerel	350,299	322,207	-8.02%
38. *Lates niloticus*	Nile perch	339,183	306,282	-9.70%
39. *Patinopecten yessoensis*	Yesso scallop	294,211	305,510	+3.84%
40. *Rastrelliger kanagurta*	Indian mackerel	280,615	302,387	+7.76%

Source : *Fishing News International* : May 2001.

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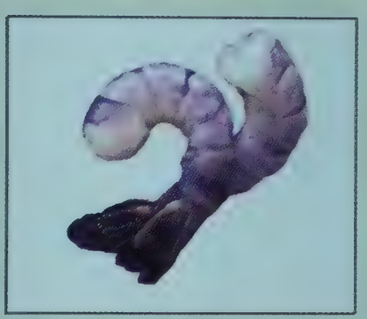

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Shelf life studies on formulated flake feeds for Goldfish, *Carassius auratus*

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Marine Biological Research Station
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The present upward trend in the growth of ornamental fish culture has accentuated the demand for related quality feeds in bulk quantities. The storage of dry feeds causes deterioration after a specific period. Storage period for feeds without changes of shelf life depends upon ingredients, their moisture content, preparation process and storage conditions. A standard diet formula consists of 30% crude protein, 15% crude fat and 34% total carbohydrate. During nutritional studies of gold fish, dry flaked diets having 30, 40 and 50% crude protein; and 15, 20, and 25% crude fat and 30, 40 and 50% total carbohydrate level were tested for shelf life and on the growth of the gold fish, C. auratus. The physical properties and nutritive value of different diets were tested for 15 days on its fry. Diets having 30 and 40% protein, 15% fat and 30 and 40% carbohydrate content showed 180 days of shelf life in terms of all physical properties, nutritive value and also on growth performance of gold fish fry. The shelf life of 50% protein, 20 and 25% fat and 50% carbohydrate in the diet indicated only 90 days of shelf life.

In aquaculture, dairy, piggery etc., the practice is to prepare the feed in bulk for its utilization over a long period. Feed so prepared is found to suffer from quality deterioration in due course of time thereby often becoming unfit for animal consumption. The reasons for deterioration of feed quality had been studied by several workers (Chiakung, 1989; Lall, 1991; New, 1987). The quality of feed undergoes changes with the passage of time due to reasons such as storage period, available moisture content of feed, way of processing, exposure to atmospheric temperature and light. These factors are responsible for promoting the process of degradation of its nutritional quality and thereby making it unfit for animal consumption.

Fungus is reported to grow at a relative humidity above 65%. The moisture content at around 15% is convenient for the growth of normal fungi group. However, some mycotoxin producing fungi even grow in 9 to 10% moisture content. The fungal growth causes weight loss, increase in temperature and moisture, discolouration and some of them produce mycotoxins which are harmful to animals.

Various workers have reported about the spoilage of feed. Chiakung (1998) reported about the reduction of tocopherols by 62 to 67% after 190 days storage along with Vitamin A and D due to oxidation. New (1987) and Lall (1991) also stated the same.

The present study is aimed at investigating the change in nutritional value, physical properties and the acceptability of the flaked diets formulated and prepared for the consumption of fry of gold fish, *Carassius auratus* by undertaking experiments on the growth and survival of the fish.

Materials and Methods

In the present experimental work, nine different artificially formulated diets having different levels of protein, fat and carbohydrate content were prepared and fed to find out the exact nutritional requirements of gold fish, *Carassius auratus* on the basis of work of Kaushik *et al*.,(1991)on protein diets;New on fatty diets, (1987); Paulraj (1995) on carbohydrate diets and to study their shelf life and acceptance. Lall (1991) reported that the diets containing high levels of protein are of poor quality protein with low level of energy supplied from the lipid which results in oxidation of protein. He further reported that excessive carbohydrates, particularly starch, stimultes the growth of fungi. New (1987) has observed the various detrimental effects caused by infestation due to growth of fungi and he also stated that the lipids breakdown into free fatty acids due to oxidation causing rancidity. Similarly, carbohydrates also ferment to produce alcohol and volatile fatty acids. In the case of protein the digestibility and solubility is reported to have come down due to prolonged storage.

The present study is carried out to revalidate the above results in respect of flaked feeds.

All the diets were prepared in the form of flakes as per Palav (1991) and formulated as per Hardy square method (Hardy, 1980). The diets used were of 30, 40 and 50% crude protein content (diet I, II and III); 15, 20 and 25% crude fat content (diet IV, V and VI); and 30, 40 and 50% total carbohydrate content (diet VII, VIII and XI). All the diets were packed in polyethylene bags as per normal procedure and were cooled at ambient temperature before packing of bags. Then they were kept at room temperature in a cupboard and used for feeding the fishes in the experiment after its storage for 0, 30, 60, 90, 120, 150, 180, 210, 240 and 270 days. The experiment for rearing gold fish using the above mentioned feeds was carried out for a fixed duration of 15 days.

The observations of physical properties (colour, crispness, odour, buoyancy, water stability, resistance to crumbling and the nutritive value) of all the diets were taken initially and after every month as per Mayers and Brand (1975), Gopal *et al*(1988); and Basu (1990). The acceptance of feed was observed for two hours on the fry of goldfish, *Carassius auratus*, size of (15.00 mm$\pm$ 0.48 mm length and 188.00 mg $\pm$ 19.00 mg weight).

The feeding was done at the rate of 7% of total body weight twice daily. The feeding rate and acceptance of feed was standardized by feeding the fishes with different feeding levels i.e. 3%, 5%, 7%, 10% and 15% of total body weight and the time required for total consumption of feed was also observed. The observations on acceptance and effect of feeds on growth of fry of gold fish were recorded for 15 days in all glass aquaria of 60 x 30 x 30 cm by using the feed stored for 0, 30, 60, 90, 120, 150, 180, 210, 240 and 270 days. 25% water was daily siphoned out to remove excess feed and faecal matter. The observations on body length and weight were taken at intervals of 5 days.

All the diets were tested for the nutritive value every month to observe the effect of storage (Gopal *et al.*1988; Basu, 1990) (A.O.A.C., 1975)

Results

Ninety days of storage showed that the physical properties (colour, odour, crispness, resistance to crumbling, buoyancy, water stability) of all the diets were found to be similar to the initial observations. However observations after 120 days of storage showed decline in all the properties in the case of diets III, V, VI and IX as compared to that of initial results. The remaining diets did not indicate any changes. Subsequently, after 210 days, observations showed that these properties had declined in the remaining diets also.

Diets III, VI, VII and IX upto 90 days of storage showed good acceptance while observations after 120 days showed acceptance of diets to be poor as compared to initial results, but the remaining feeds showed good acceptance. Observations after 210 days storage showed poor acceptance in the remaining diets, i.e. I, II, IV, VII and VIII (Table - 1).

The observations on nutritive value (Moisture, Crude protein, Crude fat, Total carbohydrate) showed that upto 90 days of storage there was no significant change in nutritive value in all the diets as compared to initial results. However, after 120 days of storage, it declined in diets III, V, VI and IX as compared to the initial results, but no such change was observed in the remaining diets. The observations after 210 days of storage showed that the nutritive values declined in the remaining diets. Significant increase in moisture content was found in the case of diet III, V, VI and IX after 120 days storage and in the case of remaining diets after 210 days storage. Correlations of protein, fat, carbohydrate, moisture content with storage days were tested and were found significant ($P < 0.05$) (Table - 2).

The observations with diets stored upto 90 days revealed that body weight, weight gain and FCR was similar in all the groups viz. I, II, III, IV. V, VI, VII, VIII, IX. Subsequently observation using feed stored for 120 days indicated poor weight gain and drop in FCR in group III, V, VI and IX as compared to the initial results. However, the observations on weight gain, and FCR were found to be better in group I, II, IV, VII and VIII upto 180 days storage. Experiment with diets stored upto 210 indicated poor weight gain and FCR in case of group I, II, IV, VII & VIII as compared to initial results (Fig. - 1).

Fungi, insects and their spores were observed in diets III, V, VI and IX after 120 days storage and in case of remaining diets after 210 days storage.

Discussion

The present investigation indicates that shelf life and acceptance of dry flaked diets vary with storage period and its ingredients. It was observed that diets I, II, IV, VII and VIII had prolonged shelf life upto 180 days, while diets III, V, VI and IX had shelf life upto 90 days. It was observed that the moisture content gradually increased in the diets I, II, IV, VII and VIII after 180 days of storage, as compared to diets III, V, VI, IX after 90 days storage (Table - I). The high protein and fat diets have been reported to be more susceptible to rancidity (New, 1987). The high protein diet, i.e., diet III with 50% crude protein content was observed to have high water content almost double in 90 days of storage, and this may be attributed to the fish meal ingredient used to provide protein supplement. Feedstuff containing lipids (ex: rice bran and fish meat), are especially susceptible to oxidation (Rumsey, 1980). However, there was no significant decrease in protein, fat and carbohydrate levels in the diets I, II, IV upto 180 days storage. The diet III was observed to have very high moisture content, low protein level and also low fat content. Similarly, the diets V and VI followed the same trend in respect of moisture content, decreasing protein and fat levels after 120 days of storage. The diets VII and VIII which contained 30 and 40% carbohydrate respectively have no significant change in protein, fat and carbohydrate level upto 180 days while there was marked decrease in the level of protein, fat in the case of IX diet after 120 days in comparison to the initial results after 60 and 90 days storage period.

Starch is the main carbohydrate in feed stuff under the reaction of alpha and beta amylase. Starch decomposes into dextrin and rafinose because of humidity above 70%. During storage the amylase action increases moisture content in feed. Due to the action of amylase, sugar decomposes into CO_2 and H_2O and dry matter decreases protein digestibility and solubility decreases. This happens due to oxidation of protein (hydrolysis). The moisture content increased by the carbohydrate causes this reaction.

Lipids break down into free fatty acids makes the feed more prone to the development of rancidity. This breakdown is caused by the damage resulting from insect infestation and fungal growth. High lipid ingredients as seen in diets with 20 and 25% fat are more susceptible to this type of chemical change as compared to others. Fish meal, vegetable oil cake and rice bran are particularly vulnerable to this type of chemical change as seen in 40% and 50% carbohydrate diet. Excessive carbohydrate stimulates the growth of fungi resulting in breakdown of starch and sugar into moisture and acetic acid and alcohol which stimulates the protein oxidation (New, 1987). Frazier and Westhoff (1995) stated that as moulds are xerophilic, they can be expected to occur and grow in dried products. The fungi could be in outside air, in the air inside the pack, and surface of product during process. The diets of 50% protein, 20% and 25% fat and 50% car-

FIG 1

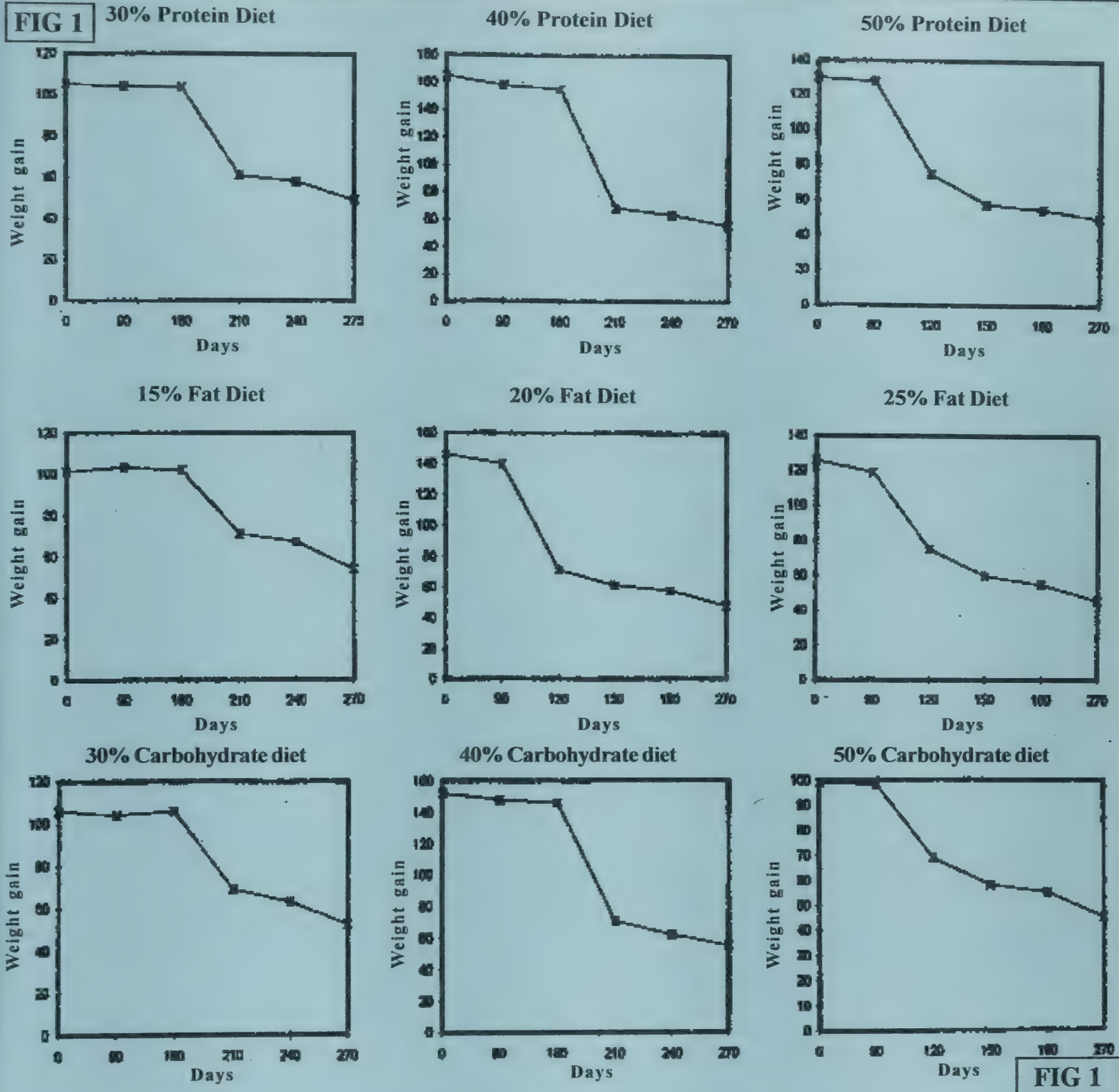

FIG 1

bohydrate deteriorates earlier, due to higher content of fish meal, fat, carbohydrate respectively which in turn reduce the physical properties (Table - 1). Nutritive value declines (Table - 2) and affects the growth of fish (Fig.1).

Further study of shelf life of flaked feeds by using different packaging materials and antioxidants needs to be conducted.

Acknowledgement

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Table -1 : The Effect of storage on physical properties of flaked diets

Diets	Observations	Fresh stock	After 90 days	After 120 days	After 150 days	After 180 days	After 210 days	After 240 days	After 270 days
	Colour	Brown	Brown	Brown	Brown	Brown	Brown	Dark	Dark
	Crispness	Crisp	Crisp	Crisp	Crisp	Crisp	less	Not	Not
	Odour	Fishy	Fishy	Fishy	Fishy	Fishy	Fishy	Rancid	Rancid
	Buoyancy	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	Less	Less
I	Water stability	Stable	Stable	Stable	Stable	Stable	Stable	Less	Less
	Palatability	Palatable	Palatable	Palatable	Palatable	Palatable	Palatable	Less	Less
	Resistance to Crumbling	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant	Less	No
	Acceptance	7%	7%	7%	7%	7%	5%	3%	2%
	Colour	Brown	Brown	Brown	Brown	Brown	Brown	Dark	Dark11
	Crispness	Crisp	Crisp	Crisp	Crisp	Crisp	less	No	No
	Odour	Fishy	Fishy	Fishy	Fishy	Fishy	Fishy	Rancid	Rancid
	Buoyancy	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	Less	Less
II	Water stability	Stable	Stable	Stable	Stable	Stable	Stable	Less	Less
	Palatability	Palatable	Palatable	Palatable	Palatable	Palatable	Palatable	Less	Less
	Resistance to Crumbling	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant	Less	Less
	Acceptance	7%	7%	7%	7%	7%	5%	3%	2%
	Colour	Brown	Brown	Brown	Brown	Dark	Dark	Dark	Dark
	Crispness	Crisp	Crisp	Crisp	Less	Not	Not	Not	Not
	Odour	Fishy	Fishy	Fishy	Fishy	less	less	Rancid	Rancid
	Buoyancy	Buoyant	Buoyant	Buoyant	Buoyant	less	less	less	less
III	Water stability	Stable	Stable	Stable	Stable	less	less	less	less
	Palatability	Palatable	Palatable	Palatable	Palatable	less	less	less	less
	Resistance to Crumbling	Resistant	Resistant	Resistant	Resistant	less	less	less	No
	Acceptance	7%	7%	7%	5%	3%	2%	2%	1%
	Colour	Brown	Brown	Brown	Brown	Brown	Brown	Dark	Dark
	Crispness	Crisp	Crisp	Crisp	Crisp	Crisp	less	Not	Not
	Odour	Fishy	Fishy	Fishy	Fishy	Fishy	Fishy	Rancid	Rancid
	Buoyancy	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	Less	Less
IV	Water Stability	Stable	Stable	Stable	Stable	Stable	Stable	Less	Less
	Palatability	Palatable	Palatable	Palatable	Palatable	Palatable	Palatable	Less	Less
	Resistance to Crumbling	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant	Less	Less
	Acceptance	7%	7%	7%	7%	7%	5%	3%	2%
	Colour	Brown	Brown	Brown	Brown	Dark	Dark	Dark	Dark
	Crispness	Crisp	Crisp	Crisp	Less	Not	Not	Not	Not
	Odour	Fishy	Fishy	Fishy	Fishy	less	less	Rancid	Rancid
	Buoyancy	Buoyant	Buoyant	Buoyant	Buoyant	less	less	less	less
V	Water Stability	Stable	Stable	Stable	Stable	less	less	less	less

Table I Contd..

	Palatability	Palatable	Palatable	Palatable	Palatable	less	less	less	less
	Resistance to Crumbling	Resistant	Resistant	Resistant	Resistant	less	less	less	Not
	Acceptance	7%	7%	7%	5%	3%	2%	2%	1%
	Colour	Brown	Brown	Brown	Brown	Dark	Dark	Dark	Dark
	Crispness	Crisp	Crisp	Crisp	Less	Not	Not	Not	Not
	Odour	Fishy	Fishy	Fishy	Fishy	less	less	Rancid	Rancid
	Buoyancy	Buoyant	Buoyant	Buoyant	Buoyant	less	less	less	less
VI	Water Stability	Stable	Stable	Stable	Stable	less	less	less	less
	Palatability	Palatable	Palatable	Palatable	Palatable	less	less	less	less
	Resistance to Crumbling	Resistant	Resistant	Resistant	Resistant	less	less	less	Not
	Acceptance	7%	7%	7%	5%	3%	2%	2%	1%
	Colour	Brown	Brown	Brown	Brown	Brown	Brown	Dark	Dark
	Crispness	Crisp	Crisp	Crisp	Crisp	Crisp	less	Not	Not
	Odour	Fishy	Fishy	Fishy	Fishy	Fishy	Fishy	Rancid	Rancid
	Buoyancy	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	Less	Less
VII	Water stability	Stable	Stable	Stable	Stable	Stable	Stable	Less	Less
	Palatability	Palatable	Palatable	Palatable	Palatable	Palatable	Palatable	Less	Less
	Resistance to Crumbling	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant	Less	Not
	Acceptance	7%	7%	7%	7%	7%	5%	3%	2%
	Colour	Brown	Brown	Brown	Brown	Dark	Dark	Dark	Dark
	Crispness	Crisp	Crisp	Crisp	Less	Not	Not	Not	Not
	Odour	Fishy	Fishy	Fishy	Fishy	less	less	Rancid	Rancid
	Buoyancy	Buoyant	Buoyant	Buoyant	Buoyant	less	less	less	less
VIII	Water stability	Stable	Stable	Stable	Stable	less	less	less	less
	Palatability	Palatable	Palatable	Palatable	Palatable	less	less	less	less
	Resistance to Crumbling	Resistant	Resistant	Resistant	Resistant	less	less	less	not
	Acceptance	7%	7%	7%	5%	3%	2%	2%	1%
	Colour	Brown	Brown	Brown	Brown	Brown	Brown	Dark	Dark
	Crispness	Crisp	Crisp	Crisp	Crisp	Crisp	Less	not	not
	Odour	Fishy	Fishy	Fishy	Fishy	Fishy	Fishy	less	Rancid
	Buoyancy	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	Buoyant	less	less
IX	Water stability	Stable	Stable	Stable	Stable	Stable	Stable	less	less
	Palatability	Palatable	Palatable	Palatable	Palatable	Palatable	Palatable	less	less l
	Resistance to Crumbling	Resistant	Resistant	Resistant	Resistant	Resistant	Resistant	less	not
	Acceptance	7%	7%	7%	7%	7%	5%	3%	2%

Abbrevations:

I Diet - I 30% II 40% Protein diet III 50% Protein diet IV 15% Fat diet V 20% Fat diet
VI 25% Fat diet VII 30% Carbohydrate diet VIII 40% Carbohydrate diet IX 50% Carbohydrate diet

Table - 2 : The effect of storage on proximate composition of flaked diets (in % on the dry weight basis)

Days	30% Protein Diet				40% Protein Diet				50% Protein Diet			
	Moisture	*Protein*	*Fat*	*Carbo*	*Moisture*	*Protein*	*Fat*	*Carbo.*	*Moisture*	*Protein*	*Fat*	*Carbo.*
0(F.S.)	6.95	31.00	14.30	34.25	7.94	41.80	11.20	25.06	7.94	50.80	8.52	19.36
90	7.20	30.25	14.00	33.75	8.34	40.20	10.80	24.85	8.50	50.00	8.00	19.10
120	NT	NT	NT	NT	NT	NT	NT	NT	9.20	40.80	6.95	18.12
150	NT	NT	NT	NT	NT	NT	NT	NT	13.70	38.12	5.62	13.38
180	8.50	29.76	12.25	32.25	9.20	38.75	10.12	24.10	16.80	32.42	5.10	10.22
210	10.50	25.12	10.22	27.28	12.50	31.25	9.25	18.17	NT	NT	NT	NT
240	15.71	23.25	9.15	25.16	14.85	29.13	7.92	16.19	NT	NT	NT	NT
270	17.21	19.20	7.12	22.12	16.92	22.24	6.12	13.00	17.25	30.12	4.42	8.25

Days	15% Fat Diet				20% Fat Diet				25% Fat Diet			
	Moisture	Protein	Fat	Carbo.	Moisture	Protein	Fat	Carbo.	Moisture	Protein	Fat	Carbo.
0(F.S.)	7.98	31.00	15.00	35.12	8.35	30.55	18.92	32.23	8.98	29.25	23.42	30.47
90	8.52	29.50	14.70	34.80	8.90	29.20	18.00	31.18	9.52	28.15	23.00	29.95
120	NT	NT	NT	NT	12.50	21.50	13.25	28.15	13.20	25.19	18.15	24.12
150	NT	NT	NT	NT	13.93	19.25	11.51	25.16	15.16	23.12	17.25	23.25
180	9.38	23.18	13.18	33.02	16.75	17.52	9.85	24.15	16.25	22.25	16.15	21.19
210	12.40	21.25	11.15	27.80	NT	NT	NT	NT	NT	NT	NT	NT
240	13.50	20.12	9.25	25.45	NT	NT	NT	NT	NT	NT	NT	NT
270	17.50	18.25	8.29	24.15	17.80	15.23	8.15	21.12	18.22	19.81	14.25	19.12

Days	30% Carbohydrate Diet				30% Carbohydrate Diet				30%Carbohydrate Diet			
	Moisture	*Protein*	*Fat*	*Carbo.*	*Moisture*	*Protein*	*Fat*	*Carbo*	*Moisture*	*Protein*	*Fat*	*Carb.*
0(F.S.)	7.52	34.25	15.22	33.23	7.70	26.12	14.80	40.78	7.83	14.52	12.39	51.42
90	8.52	33.00	14.50	32.12	8.20	25.22	13.95	40.12	8.85	14.12	11.85	51.01
120	NT	NT	NT	NT	NT	NT	NT	NT	13.85	10.22	9.52	40.12
150	NT	NT	NT	NT	NT	NT	NT	NT	15.50	9.04	7.95	37.95
180	9.23	29.25	13.25	30.58	9.43	22.17	11.23	39.04	16.80	7.14	7.05	35.13
210	14.00	23.58	11.25	24.69	15.20	17.25	9.23	29.55	NT	NT	NT	NT
240	16.20	21.12	9.12	20.15	17.21	15.85	7.02	24.12	NT	NT	NT	NT
270	17.20	19.22	7.23	17.22	19.20	13.22	5.12	19.15	18.85	5.85	5.17	32.11

Abbreviations : NT - Not tested F.S. - Fresh stock

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Fisheries Development Proposals in Jharkhand State

1. Establishment of Fisheries Directorate

A proposal with an outlay of 24.30 lakhs has been submitted to Govt. for establishment of Fisheries Directorate for Jharkhand State.

2. Development and renovation of Fish pond in tribal area

A proposal has been submitted with an outlay of Rs.100.00 lakhs for development and renovation of ponds in tribal area. There is a proposal to construct fish hatchery at Dumka and Palamu. Renovation of fish seed farm of Doranda, Ranchi, Gumla, Semdega, Lohardaga, Chaibasa, Jamshedpur, Palamu, Pakur, Godda, and Sahebganj, 60% of the total seed produced will be sold to fish farmers & 40% will be distributed among poor fish farmers as subsidy.

3. Fisheries Extension Programme

A proposal with an outlay of Rs. 5.00 lakhs has been submitted for Fisheries extension programme under which seminars, workshops, Exhibitions will be conducted and publication of leaflets will be done.

4. Strengthening of Fisheries Research

For strengthening the fisheries research programme a proposal for Rs. 3 lakhs has been submitted. The Research unit has been asked to prepare comprhensive survey report of the State to show the status of Fish production.

5. Reservoir development

A proposal for Rs. 5.20 lakhs has been submitted for reservoir development.

6. Subsidy for fish farmers

A proposal for Rs. 40.00 lakhs has been submitted for subsidy for pond construction, nets, manure etc.

7. House for fishermen

A proposal has been submitted seeking an outlay of Rs. 124.00 lakhs for construction of houses and other facilities for fishermen. In this programme 300 houses will be constructed in Palamu, Dumka, and Singbhum district.

Indian Fish Production 1999 – 2000 *(in tonnes)*

S.No.	*States/Uts*		*Marine*	*Inland*	*Total*
1.	Andhra Pradesh	:	166482	380580	547062
2.	Arunachal Pradesh	:	0	2395	23951
3.	Assam	:	0	159768	159768
4.	Bihar	:	0	254740	254740
5.	Goa	:	62113	3509	65622
6.	Gujarat	:	670951	70328	741279
7.	Haryana	:	0	30000	30000
8.	Himachal Pradesh	:	0	6995	6995
9.	Jammu & Kashmir	:	0	19010	19010
10.	Karnataka	:	165653	126846	292299
11.	Kerala	:	575600	73900	549400
12.	Madhya Pradesh	:	0	127429	127429
13.	Maharashtra	:	397901	135390	533291
14.	Manipur	:	0	15506	15505
15.	Meghalaya	:	0	4676	4676
16.	Mizoram	:	0	2890	2890
17.	Nagaland	:	0	5000	5000
18.	Orissa	:	125935	135303	261238
19.	Punjab	:	0	47177	47177
20.	Rajasthan	:	0	12968	12968
21.	Sikkim	:	0	140	140
22.	Tamilnadu	:	363000	112000	475000
23.	Tripura	:	0	29340	29340
24.	Uttar Pradesh	:	0	192714	192714
25.	West Bengal	:	180000	865700	1045700
26.	Andaman & Nicobar	:	28147	56	28203
27.	Chandigarh	:	0	2	2
28.	Dadra & Nagar Haveli	:	0	29	29
29.	Daman & Diu	:	15946	0	15946
30.	Delhi	:	0	4300	4300
31.	Lakshadweep	:	13600	0	13600
32.	Pondicherry	:	38620	4210	42830
33.	Deep Sea Fishing Sector	:	30000	0	30000
	Total		**2833848**	**2822701**	**5656549**

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FISHING CHIMES

Karnataka Newsletter

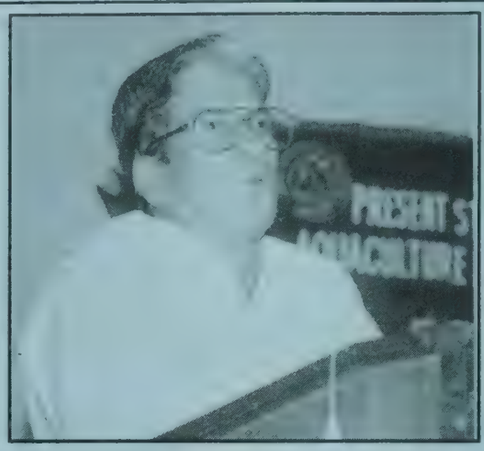
From H.N. Chandrasekhariah

State Level Seminar on "Present Status and Future Challenges of Inland Aquaculture in Karnataka in the New Millennium"

University of Agricultural Sciences, Bangalore MARCH 2-3, 2001

In line with global trends, due to the stagnating growth in marine fish production of India, aquaculture has assumed importance as a major avenue for enhancing Indian fish production. At present, inland fish production of India, mostly contributed by aquaculture, is on par with marine fish production. Inland fish production has registered an annual growth rate of 6%.

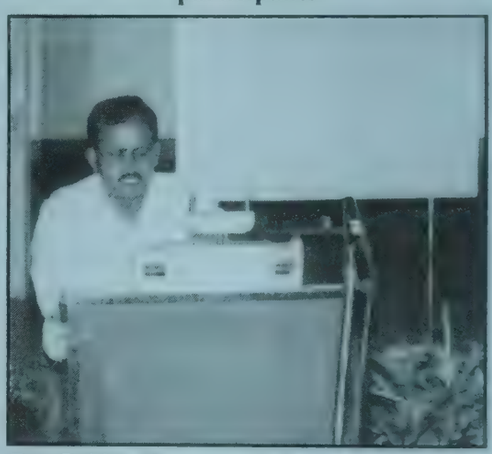
The State of Karnataka, although bestowed with vast inland aquaculture resources, its contribution to the national fish production is very low (4.5%). In order to enhance the aquaculture production, concerted efforts of scientists, development departments, administrators, planners and policy makers are very essential.



Keynote address by Dr. K.V. Devaraj, former Vice-Chancellor, UAS, Bangalore

Mr. D.M. Abdul Hameed, Director of Fisheries, Karnataka addressing the participants

Dignitaries on the daiss : Inaugural Function



Dr. C. Vasudevappa, Fisheries Research Officer, UAS, Bangalore presenting Research and Development activities of various Institutions in Karnataka

View of the participants in the Seminar

Considering the changed scenario in relation to resource status, utilization pattern, new aquaculture systems, undesirable entry of certain exotic species, increasing demand for fish etc., the University of Agricultural Sciences, Bangalore, in collaboration with the State Department of Fisheries, Government of Karnataka, organized a two-day State Level Seminar on 'Present Status and Future Chal-

Dr. P.S.B.R. James, former Director, CMFRI, Cochin, presenting seminar's recommendations at the plenary session

lenges of Inland Aquaculture in Karnataka in the new millennium", on 2-3, March, 2001. The Seminar was held in the Kannada Sabhangana of UAS, Hebbal Campus, Bangalore. There were around 130 participants, representing senior fishery scientists, State Govt. officials including, administrators, planners, and policy makers, officials of banks, representatives of several public sector undertakings and co-operatives and non-govt. agencies, private companies, progressive farmers and such others interested/involved in aquaculture development in the State. The seminar was co-sponsored by Karnataka Co-operative Fisheries Federation, Mysore, Indian Space Research Organisation and Karnataka State Pollution Control Board, Bangalore.

The objectives of the Seminar were i) to bring together the technologists, environmentalists, administrators, bankers, entrepreneurs, progressive farmers and such others involved in the development of fisheries and aquacultural activities in the State, ii) to deliberate on issues related to present status of fisheries resources and their utilization, on-going developmental programmes and policies, and resource assessment, particularly through remote sensing, iii) to assess status of developed aquaculture technologies with reference to research and development activities at state level in comparison to national position, iv) and to take stock of issues related to environment, aquatic pollution, role of co-operatives in aquaculture production and marketing, institutional finance and such others, and v) to develop a document outlining strategies, policy alternatives and roles of institutions/organizations for rapid and sustainable development of aquaculture in the State of Karnataka.

Inaugural Session

The dignitaries, delegates and participants were welcomed by Dr.A.M.Krishnappa, Director of Research, UAS, Bangalore. Dr.C.Vasudevappa, Fisheries Research Officer, Fisheries Research Station, Hesaraghatta, UAS, Bangalore and Organizing Secretary of the Seminar briefed the gathering about the Seminar and spoke on the theme of Seminar.

Mr. B. Ramanath Rai, Minister for Fisheries, Ports and Area Development, Government of Karnataka, Bangalore inaugurated the Seminar by lighting the traditional lamp. He congratulated the scientists of Fisheries Research Station, Hesaraghatta and officers of the Department of Fisheries for their efforts in organizing the Seminar. The need for greater focus on freshwater aquaculture through increased inputs by scientists, administrators and policy-makers was emphasised by him, pointing out that the activity was a major source for enhancing fish production in the State. Drawing the attention of participants towards available water resources, various related schemes and programmes to promote aquaculture, he particularly appealed to the scientists and extension personnel to work effectively to develop new innovative technologies and transfer them to the beneficiaries in an effective manner. He assured that the recommendations of the Seminar would receive due attention of Government while formulating policies and programmes on freshwater Aquaculture for the State of Karnataka.

The Keynote Address of the Seminar was delivered by Dr.K.V. Devaraj, Fisheries Consultant (World Bank) and former Vice Chancellor, UAS, Bangalore. Aspects of Inland fishery resources management, cultivable fish species and aquaculture practices, fish seed production, feeds, nutrition, manure and fertilizers, genetic engineering, pollution in aquaculture, fish health, aquaculture extension, research and development, post harvest technology, and finance needs of aquaculture were covered in the address. The need for careful introspection of various aquaculture systems followed and their adoption and management methods with reference to identification of short-comings and gaps was stressed. Involvement of NGOs, community participation and cooperative approaches in the implementation of rural aquaculture programme was highlighted.

Mr. D.M. Abdul Hameed, Director of Fisheries, Government of Karnataka related the present status of aquaculture production in Karnataka and the ongoing efforts of the Dept. of Fisheries to promote aquafarming in the State.

The Vice-Chancellor, UAS, Bangalore, Dr.S.Bisalaiah, in his presidential address, appealed to the participants to deliberate on issues related to aquaculture for technology generation, its dissemination and development of support systems in the light of emerging liberalization and globalization and also on quality consciousness for export of fish and fish products. The need for identification of strengths, weaknesses, opportunities and threats in aquaculture systems was stressed by him with a note of exhortation to promote sustainable aquafarming.

The vote of thanks was proposed by Mr. H.S.Veerappa Gowda, Joint Director of Fisheries, Government of Karnataka, Bangalore. The inaugural function was moderated by the Programme Committee Chairman, Dr.D. Seenappa, Associate Professor, Aquaculture, UAS, Bangalore.

TECHNICAL SESSIONS

Session I : Resources and Utilization

Mr. S.N.Shanmukha, former Director of Fisheries, Department of Fisheries, Government of Karnataka chaired the session with Dr.Anil Agarwal, Senior Scientist, ICAR, New Delhi, as co-chairman. Mr. D.M.Abdul Hameed, presented a lead paper on 'Inland Water Resources and Fish Production in Karnataka'. Dr.D.N.Singh, Officer-in-charge, reservoir division of CICFRI, Bangalore presented paper on 'Management measures to develop fish production in rivers, reservoirs and tanks of Karnataka.' The paper on Status, potential and scope of brackishwater aquaculture with particular reference to Karnataka was presented by Dr.S.M. Pillai, Senior Scientist on behalf of Dr.G.R.M.Rao, Director, CIBA, Chennai. Dr. H.Honne Gowda, Director, Karnataka State Remote Sensing Application Center (KSRSAC), Bangalore, presented a paper on 'Remote Sensing and GIS for development of lentic water in-

formation system for Inland aquaculture extension.

After the presentation of lead papers the panel discussion, participated by the experts Dr.S.P.Ayyar, former Director, CICFRI, Barrackpore, Dr.P.S.B.R.James, former Director, CMFRI, Cochin, and Mr. H.N.Chandrashekaraiah, former Joint Director of Fisheries (Inland), Department of Fisheries, Government of Karnataka, was held. The panel suggested : i) urgent need for the development of fishery policy for the State, ii) constitution of Think Tank comprising all institutions/ departments involved in fisheries programme in the State, iii) development of data base on resource status through remote sensing and GIS, iv) renovation/ rejuvenation of aquatic resources for enhancing fish production, v) utilisation of canals for fisheries department, vi) crash programes on fish seed production in manageable water bodies, vii) development of freshwater prawn culture, viii) focussed attention on reservoir development for aquaculture, ix) development of brackishwater aquaculture for finfish and shellfish, utilizing the available technologies and x) diversification of fish species for culture.

Session II: Research and Development

This Session was chaired by Dr.K.V.Devaraj, and co-chaired by Dr. R.D. Chakraborty, former Aquaculture Consultant, FAO.

Dr.Anil Agarwal gave a brief account of organisational and operational infrastructure for fisheries development and also for fisheries education in India. He highlighted the status of fisheries resources of the country and the role of various organizations in the promotion of fisheries activities. Infrastructural support for fisheries education, development, export promotion was also covered. He told the participants that an increase in budget allocation for expanding fisheries research and development activities would depend on encouraging apprisals of the ongoing work.

A comprehensive account of research accomplishments of various fisheries research institutions in the State was provided by Dr. C. Vasudevappa. He appealed to the scientists to develop R & D programmes based on available resources and immediate needs of farmers. He pointed out the urgent need for carrying out research on priority issues that emanated from the field.

Dr.P.Keshavanath, Professor and Head, Department of Aquaculture, College of Fisheries, Mangalore briefed the research achievements of the College on aspects of culture practices, genetics and breeding, nutrition and feed development and health management. The need for developing technological know-how/ improving the available technologies for enhancing aquaculture production was emphasized.

An account on prospective commercial aquaculture practices viz. freshwater prawn farming, ornamental fish culture, pearl farming, integrated farming, vermi - composting, bio-fertilizers, sewage fed fish culture, cage and pen farming, all with a high degree of promise in Karnataka, was provided by Dr.P. Kumaraiah OIC Peninsular Aquaculature Division, CIFA, Bangalore.

The developmental programmes and extension activities in respect of inland fisheries of Karnataka were presented by Mr. H.S.Veerappa Gowda. He narrated the organisational structure of Department of Fisheries and in that context spoke on the leasing policies, and various programmes on fish seed production, rearing and distribution, development of reservoir fisheries and of water logged areas, freshwater prawn farming, pond construction, schemes of FFDAs, marketing of fish including ornamentals, special component plan, training of fishermen and fish farmers etc. A panel of experts comprising Dr.A.E.Ekanath, Vice President, Genomar, Oslo Research Park, Norway, Dr.K.M.Shankar, Associate Professor, College of Fisheries, Mangalore and Dr.N.R.Ramakrishna, Deputy Director of Fisheries, Department of Fisheries, Government of Karnataka, led the deliberations and suggested the need for economic appraisal of proven technologies, intensification of interaction between research institutions, development departments and farmers within and outside the State, impact assessment of programmes and schemes of department of fisheries, identification of gaps, and refinement of programmes and policies related to aquaculture production in the State. They exhorted the scientists to link R & D with technology transfer.

Session III : Environment, Finance, Cooperation and Socio-Economics

This Session was chaired by Dr.S.L.Shanbogue, Director of Instruction, College of Fisheries, Mangalore. Mr. Gnanaleela, former Director of Fisheries, Government of Karnataka was the co-chairman.

Dr.B.R. Balagangadharan, Scientist and Head, Aquatic Eco-toxicology Division, Karnataka Pollution Control Board, Bangalore, gave a brief account of aquatic pollution and its effect on fauna and flora of water bodies and also on issues related to monitoring of pollution by Pollution Control Board.

The role of co-operatives in aquaculture production and marketing was explained by Dr.C.K.Murthy, Managing Director, Karnataka Co.op. Fisheries Federation, Mysore. He briefed the activities of KCFF on aspects related to augmentation of fish seed production, development of fisheries wealth in tanks and reservoirs through Fisheries Co.op. Societies, providing support service for improved harvesting and handling of fish and establishsing marketing system for freshwater fish. The need for development of by- products like minced meat from tilapia and such other varieties of fishes and also establishment of fish production estates in areas congenial for industrial aquaculture was highlighted.

Dr.R.V.Reddy, Manager (Fisheries), NABARD, Bangalore, dealt with aspects of institutional finance and credit facilities for aquaculture development. He gave an account of the role of NABARD in Fisheries development, credit dis-

bursement to fisheries sector, various bankable schemes in aquaculture and the promotional/developmental support extended by the banks for aquacultural activities in the State.

A panel of experts consisting of Prof. T.J.Varghese, former Director of Instruction, College of Fisheries, Mangalore, Dr.N.G.S. Rao, former OIC, CIFA Unit, Bangalore and Mr. M.Manjunath, Assistant General Manager, Agril. Finance Corporation, Bangalore emphasised the immediate need for identification of hot spots of pollution in different water systems, places of bio-accumulation of pollutants and related health hazards, conservation of fisheries resources, reclamation and rehabilitation of water bodies, encouragement to co-operatives to promote aquaculture activities, simplification of finance and credit facilities and insurance support for aquaculture.

Session IV : Open House

In an open house discussion that followed, there was close interaction among farmers, scientists, administrators, bankers and other agencies involved in aquaculture promotion in the State. The Session was chaired by Dr. V. Veerabhadraiah, Director of Extension, UAS, Bangalore, and co-chaired by Mr. D.M.Abdul Hameed and moderated by Dr.D.Seenappa. The panel of experts included Dr.A.M.Krishnappa, Mr. Nanjegowda, Chairman, KCFF, Mysore, Dr.R.V. Reddy, NABARD, Mr. M.F.Rehman, Technical Officer, CICFRI and Mr.K. Venkataswamy, a progressive fish culturist. The deliberations were centered on development of aquaculture as a commercial enterprise in Karnataka, on impact of exotic fish species viz., tilapia and African catfish, on marketing of fish and on effective transfer of fish farming technologies for field level adoption.

The farmers who participated appealed to the authorities to modify the existing fishery leasing policy of water bodies in the State, to initiate stringent measures to check pollution, to consider procurement of fish from farmers at village level by KCFF, to reduce cost of seed and to extend incentive schemes for purchase of aquaculture inputs viz., seed, feed, manures, etc., and for regular supply of stunted carp fingerlings to promote fish culture in seasonal tanks/ ponds. The need for discouraging farming of Thai Magur which was coming up in the State was also emphasized.

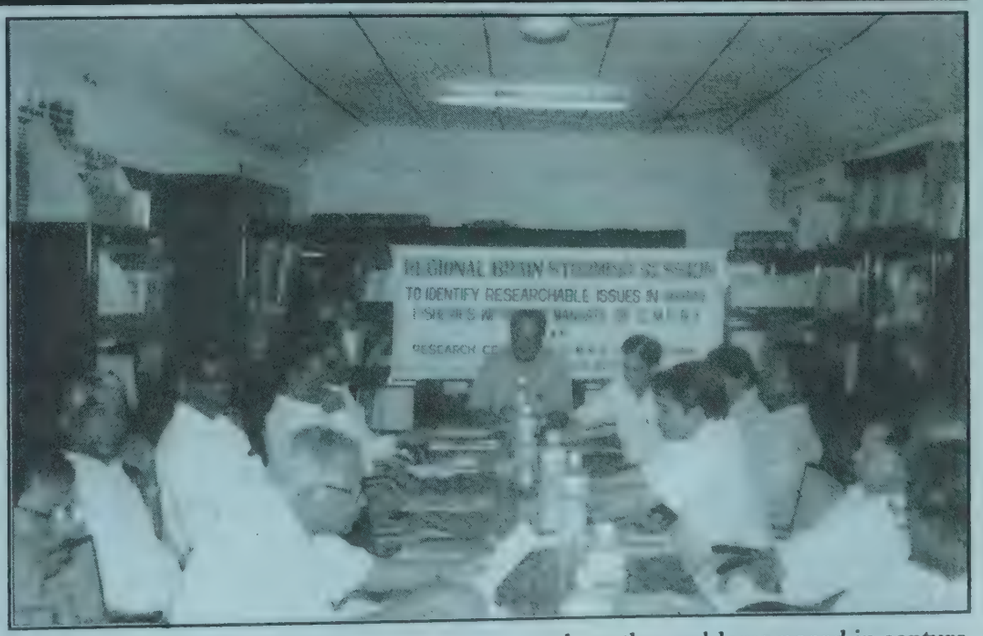
Session-V: Plenary Session

The Chairmen of all technical sessions presented their recommendations and these were deliberated upon under the Chairmanship of Dr.P.S.B.R. James and co-chairmanshsip of Dr.S.P. Ayyar. The house suggested to the organisers to to formulate and present specific recommendations based on the suggestions made in each of the Sessions. In this regard a group had been constituted to draft the recommendations and to prepare a document enlisting the guidelines for enhancing aquaculture production in Karnataka. It is hoped that this document would serve as reference for the government and various other organisations involved in aquaculture development.

Dr.C.Vasudevappa, on behalf of the organisers, profusely thanked all the resource persons, panel members, officers of the department of fisheries, farmers, sponsors, and officers of UAS, Bangalore, who served in various Committees, and staff of Fisheries Research Station, Hesaraghatta, Bangalore for their contribution and support in making the seminar highly successful.

Karnataka Region-Level Brain Storming Session for Identifying Research Needs / Issues : CMFRI, Mangalore : 24 March 2001

A Regional Brain Storming session to identify research needs/issues in marine fisheries and mariculture which fall within the purview of the mandate of the Central Marine Fisheries Research Institute (CMFRI), Kochi was held at the Conference Hall of the Mangalore Research Centre of CMFRI on 24-3-2001. This was held in the context of the process of reorganization of the the research priorities of CMFRI by involving all stake holders in marine fisheries and mariculture in each of the marine States of the country.



Dr. C. Muthaiah, Senior Scientist and Officer-in-charge of the Mangalore Research Centre of CMFRI, welcomed the distinguished guests and explained the research programmes and achievements of the Karwar and Mangalore Research Centres in the field of marine fisheries and mariculture. He requested the participants to offer their valuable suggestions for re-orienting the on-going research on the problems posed in capture marine fisheries and mariculture in Karnataka.

Dr. S.L. Shanbhogue, Director of Instruction, College of Fisheries, Mangalore, chaired the session. In his opening remarks Dr. Shanbhogue emphasised the need for a critical review of research work and consolidation of all the work carried out so far at the two Centres of CMFRI in Karnataka so that proper steps could be chalked out for implementing future research programmes. He requested the participants to present their views/problems which are relevant to the mandate of the Karwar and Mangalore Research Centres, so that future projects of the Centre could be reorganised on these lines.

One of the major problems expressed by the leaders of various fishermen's associations was the declining returns in fishing operations both in terms of quantity and quality. Several of the fisher leaders attributed the following reasons for this trend in the marine fishing sector of Karnataka.

1. Deep-sea trawlers, mainly of foreign origin, virtually swept the sea bottom by their continuous day and night trawling operations, resulting in severe damage to the ecosystems and in non-availability of harvestable fish resources for the local fishermen. These trawlers might be dumping a large quantity of dead trash fishes (discards) back into the sea, which may lead to pollution and cause damage to the eco-habitat in the deep sea.

2. Over-exploitation of the fishery resources by the existing multi-day crafts in the near shore area and unlimited addition of fishing crafts every year had led to diminished catch per unit effort.

3. Pollution was being caused by the effluents discharged by the mega-industries established along the Karnataka coast. The fishermen were of the opinion that the effluents were not being treated properly or to the extent required before their discharge into the sea and that this had resulted in the deterioration of the water quality and complete destruction of the habitat and fishery in the vicinity of the effluent discharge points.

4. During monsoon season large boat seines, the so-called 'indigenous gears' were being operated using the plank-built canoes with out-board engines having a capacity upto 45 H.P. These boat seines, being very large in size, similar to the regular small meshed purse seines used by large purse seine boats were overexploiting fish stocks beyond sustainable level. The boat seine operation was similar to that of purse seiners but the operations took place in the nearshore waters within 10-25 m depth area. It is feared that this resulted in complete destruction of brood-stock, juveniles and young fishes, particularly in the nearshore waters during monsoon months, they said.

The fisher leaders wanted a strict and continuous monitoring of the coastal waters to detect pollution. They also suggested a ban on operations of large foreign trawlers off Karnataka coast. Restriction of the number of units in operation in the presently fished grounds and complete fishing ban by all kinds of mechanised/motorized units during the monsoon months (June - August) was also suggested. The President of the Country Boat Owners' Association, New Mangalore Area, expressing himself against a total ban, explained that such a measure would affect the livelihood of more than two lakhs of fishermen from the Mangalore region alone, dependent on fishing during the monsoon months. Fisher leaders also wanted tangible research to be carried out on the operational aspects of crafts so as to reduce the cost of fishing operations. They felt that replacing fuel with natural gas or other substitutes deserved study. Another aspect was that the fishermen wanted Mangalore and Karwar Stations to act as centres for prioritising the transfer of technology programmes. Though CMFRI had contributed significantly in the marine capture and culture fisheries, the local fisherfolk were not aware of the details was one observation made. They wanted all the results emerging from the research work to be disseminated among the end users preferably in the local language. They also expressed dissatisfaction at the delay in the receipt of the PFZ maps/information and wished that the same could be translated into local language so that fishermen could comprehend them better. In addition, the fishermen wanted the schemes especially the pension benefit schemes implemented in Kerala, to be implemented in Karnataka also.

Prof. Madyastha, Chairman, Department of Bio-sciences, Mangalore University, desired the Research Centres to take up research on the following aspects : 1) Study the changes on the bio-diversity profile of the Karnataka coast and their impact on the food fishes, resulting in change in species composition of the fishery; 2) Suggest methods of diversifying fishing operations which would be more economical; 3) Survey seaweed resources along the Karnataka coast and study their culture prospects; 4) Demonstration projects may be taken up and unemployed youth may be encouraged to take up such activities; 5) Identify critical habitats and ban all kinds of fishing activities in such habitats; 6) Survey of the coral reefs off Karwar and an in-depth bio-diversity study of such areas may be made.

Prof. Madyastha also said that fishing during monsoon should be completely banned as this activity wiped out young fishes which in fact formed the resource for the next fishing season.

Mr. Kotekar, a fisherman entrepreneur presented the following points for consideration : 1) The reason for declining catches was on account of irresponsible fishing by the fishermen themselves and not due to pollution as contended by many; 2) Fishing during monsoon by the so-called indigenous gears had resulted in complete destruction of young ones causing irreparable damage to the future fish population. Only line fishing and boats without any kind of mechanization should be allowed to operate during the monsoon months; 3) The Government of Karnataka should effectively implement closed season during monsoon; 4) Diversified schemes should be developed and popularized to generate income for the fishermen during the monsoon months. The mega industries set up along the coast of Karnataka should be

directed to provide job opportunities to the fisher youths; 5) Fishery data should include not only the exploited fisheries but also the available balance of fish stocks. This data should be correlated so as to forecast the fisheries. 6) Investigations should be taken up to understand the reasons for the decline of lobster fishery along the coast - whether this decline was due to depletion of needed lobster food in the fishing grounds, and 7) Research might be taken up to identify the main reasons for decline in mackerel and oil sardine fishery.

Prof. P.K. Salian, former Director of Instruction, College of Fisheries, Mangalore, remarking that most of the points raised did not fall within the mandate of the Research Centres, emphasised the need for the following items of work to be taken up by the Centres :- 1) Transfer of technologies developed by the Institute should be carried out by the centres to benefit the local fishermen, through the medium of local language, 2) CMFRI might find out the reasons for the decline of mackerel and oil sardine fishery and indicate whether the stocks could be restored to the level that existed in the pre-purse seine era (Rampani days). He also wanted that studies might be taken up to find out whether the decline was due to the effect of fishing by the traditional gears during the monsoon season, industrial pollution and reduction in the mesh size of the gears operated.

Prof. T.J. Varghese, former Director of Fisheries, College of Fisheries, Mangalore presented the following points for consideration : 1) Extension brochures needed to be brought out regularly in the local language to inform the fishermen of the activities and achievements of the Centres instead of the usual annual reports. 2) Quick dissemination of the details of PFZ by the NRSA to the fishermen. 3) Establishment of a pollution control board in the area. 4) Primary productivity and water quality to be monitored on a regular basis all along the coast. 5) Regulation of mesh size to permit escape of young fishes. 6) Taking up stock assessment of shrimps. 7) Closed season observed in Kerala had resulted in good fishing in the following season. Therefore, ban on fishing during monsoon should also be enforced strictly in Karnataka, with good policing and full co-operation of the local fishermen.

Dr. C. Muthaiah, pointed out that a 10 mm reduction in the cod end mesh size of trawl nets was observed as compared to a study conducted 15 years back.

Mr. D.M. Abdul Hameed, Director of Fisheries, Government of Karnataka, also wanted the Centres to take up the following : 1) The technologies developed should be made available to fishermen in the local language on a regular basis. 2) Detailed study should be conducted on the impact of monsoon fishing by traditional mechanised units and the results would have to be correlated with the results in previous years. 3) Closer interaction between the Research Centres and the State Fisheries Department was necessary, 4) Results of the fishing craft and gear census conducted during 1998 would have to be published soon and copies made available to all concerned. 5) Candidate species for sea farming/sea ranching would have to be identified and farming techniques would have to be popularised. 6) Hot spot areas sensitive to pollution to be identified and regular monitoring of them to be carried out. The combined effects of the effluents discharged from the several mega industries to be studied. 7) The economics of operations of different crafts would have to be done on a regular basis and the results passed on to the State Departments.

The Scientists appealed to the Director of Fisheries, Government of Karnataka to enforce the system of maintainence of log books by the fishing boats, as these would provide reliable information on fishing effort, area and depth of operations etc., essential for estimating/assessment of fish stocks and to also suggest management strategies to the concerned.

Dr. S.L. Shanbhogue, Director of Instruction, College of Fisheries, Mangalore, during the course of discussion made the following remarks : 1) Though the potential marine fishery yield for Karnataka was around 4 million tonnes, only half of this quantity was being exploited presently. The government of Karnataka should take this into account before implementing any restrictions on fishing. He also suggested that the Research Centres could take up revalidation of marine fishery potential yield of Karnataka and give depth-wise estimates for the benefit of the fishing industry; 2) Fluctuations in catch being inherent to the fishery in tropical waters, care must be taken to manage the fishery in such a manner that resources were not over-exploited. Management measures suggested by the research institutes such as the optimum number of units that could operate in an area, etc., should be adhered to by the fisherfolk; 3) As most of the pelagic species have prolonged spawning periods extending over several months, this aspect must be taken into account before proclamation of a total ban/closed season. 4)The Centre should introduce and popularize Fish Aggregating Devices (FADs) to enhance fish production in the inshore waters. 5) In view of the abundant availability of Anchovies along the Karnataka Coast, the Department of Fisheries, Government of Karnataka should propose schemes to popularize anchovy seines to encourage fishermen to harvest the resource. 6) Interaction between fishermen, scientists and fishery entrepreneurs should be given priority. The College of Fisheries, Mangalore would extend all help in this regard. 7) Endangered species should be identified and means to protect and conserve them should be suggested. 8) Culture of catfish, seaweeds and other high unit species deserved promotion. 9) The Centre should have a full-fledged website which would enable quick dissemination of the research results to public.

Dr. Kakati, Senior Scientist and Officer-in-charge of the Karwar research centre presented the problems encountered by the fishermen of Uttara Kannada District. The problems were more or less similar to that of the fishermen of Udupi and Dakshina Kannada Districts. On be-

half of the Director, CMFRI and staff of both the Research Centres of Karwar and Mangalore, Dr. Kakati thanked all the participants for their active participation and projecting problems faced in marine fisheries. He said that all the points raised would be presented at the National Level Session for consideration. The brainstorming session gave an excellent opportunity for one and all to get to know and discuss the locally relevant issues/ problems and actions in the field of marine fisheries and mariculture to resolve them. The participants desired that such meetings could be held often, in the interest of marine fishery development of the region.

Messers Kariappa Kanchan, President Deep Sea Fishermen's Association, Malpe, Madhava Shriyan, President, Karnataka Purseseine Fishermens' Association, South Wharf, Bunder, Mangalore, Seetharama Suvarna, President, Mangalore Trawl Boat Owners' Association and President, Trawl Board Union, Mangalore also participated. Messers T.V. Kanchan, President, Country Boat Owners' Associaton, Panambur, New Mangalore Area, Keshava M Kotian, President, Malpe Mechanised Boat Owners' Co.op. Society, Malpe, Janardhana Kanchan, Secretary, Malpe Fishermen Association, Malpe, Shivappa Kanchan, President, Malpe Fishermen Association, Malpe, V.K. Shetty, Deputy Director, Department of Fisheries, Mangalore, B.M. Rajgopal and Parashwanath, Asst. Director of Fisheries, Mangalore, N.S. Siddaraju, Hatchery Manager, B.F.D.A., Kumta, U.K. Dr. C. Muthaiah and Dr. V.S. Kakati, Senior Scientists and Officer-in-charge of KRC of CMFRI Mangalore and Karwar respectively, Dr. P.K. Krishna Kumar, Mr. P.U. Zacharia, Mrs. Prathibha Rohit, Scientists, (Senior Scale) MRC of CMFRI, Bangalore, Mr. A.P. Dinesh Babu and Mrs. Geetha Shashikumar, Scientists, MRF of CMFRI, Mangalore were the other distinguished participants.

Two Prestigious National Fellowships to Dr. K.V. Devaraj

In recognition of his contributions to teaching, research and extension in the fields of Aquaculture and Fisheries Management during the past four decades, the National Academy of Agricultural Sciences, New Delhi and the Indian Fisheries Association, Mumbai have conferred their prestigious Fellowships this year on Dr. K.V. Devaraj, Fishery Scientist of International repute from Karnataka state. Dr. Devaraj was formerly the Vice-Chancellor, University of Agricultural Sciences, Bangalore and the President, Asian Fisheries Society (Indian Branch). He is the recipient of several State, National and International awards, medals, fellowships and achievement certificates. Presently Dr. Devaraj is the Fisheries Consultant to the World Bank and RITES, New Delhi and is serving on several National Committees on Fisheries.

Bleak Future staring at Bangladesh Scampi Hatcheries

All the three hatcheries of Bangladesh, located in Jessore town are reported to be experiencing severe operational problems such as acute shortage of live feed, and transport problems for having saline water. Further, funding constraints are stated to have become a major obstacle to keep the hatcheries running. The hatcheries had been set up to popularise scampi culture in the country.

Two of the hatcheries are run by private entrepreneurs and the other by BRAC, a non-government organisation, according to a report in *Fish Farming International*. It is stated that Bismillah Larva hatchery, owned by Munshi Afsar Uddin, is the biggest of the three hatcheries. Its production capacity is eight million larvae a year, while that of another, owned by Habibur Rahman, is 3.5 million. The BRAC hatchery produces four million larvae a year. Initially, the performance of all three hatcheries was quite promising. But subsequently, production suffered due to scarcity of live food and saline water, the report says.

Within a short time of the hatcheries coming up a large number of fish culturists of Bangladesh developed interest in prawn culture. They are now disillusioned because of setback in PI production at the hatcheries.

The owner of Bismillah hatchery is reported to have said that activities of all the hatcheries had been stopped since last year, due to the spiralling cost of artemia in the market. Recent prices in Dhaka have been as much as two and a half times the levels of last year which has led to the stoppage of imports, it is stated.

Regarding the saline water crisis, truck drivers are understood to have refused to carry barrels of saline water, saying that the body and engine of their vehicles have every chance of getting damaged during the transportation.

The financial institutions are blamed for their bureaucratic attitude towards growth and development of hatcheries, the report says.

Training on Seafood Product for Fisherwomen CIFE, Mumbai : 22 - 27 Jan 2001

A special training programme was organised for the fisherwomen of Versova village during 22-27 January, 2001 at the Central Institute of Fisheries Education, Mumbai. In this programme 21 fisherwomen were trained in the preparation fish papad, fish chakli, fish sandwich, prawn pickle etc. Quality control was a special part of the training programme.

FISHING CHIMES

ORISSA NEWSLETTER

From **H.S.Badapanda**

Seminar on Eco-Friendly and Sustainable Freshwater Prawn Culture

A one day farmers' Meet on 'Eco-friendly and sustainable freshwater prawn culture' was held at Sambalpur, Orissa, on 2nd March, 2001 at the auditorium of the Collectorate. One in the series of awareness compaigns organised by MPEDA in association with the State Fisheries Department of Orissa to promote export promotion of scampi in the State, this Meet was chaired by Mr.S.Mishra, IAS, Project Director, DRDA,Sambalpur. Two keynote addresses were delivered, one by Mr.H.S.Badapanda, Deputy Director of Fisheries(Retd), Govt. of Orissa, and another and by Mr.G.B.Tarai, Deputy Director of Fisheries(NZ) Sambalpur.

There were two technical sessions participated by nearly 60 prawn farmers. There was a question and answer session at which technical aspects related to successful prawn farming were clarified to the farmers by Mr.B.C.Behera, Deputy Director, MPEDA, Bhubaneswar and others.

At the end of the meet nine recommendations emerged, mainly on seed demand and supply, freshwater prawn hatchery installations, feeding, management techniques in freshwater prawn farming, diseases encountered during culture, technology package available at present etc. The Meet generated significant awareness on prawn culture among fish farmers of the State.

At the conclusion of the Meet, Mr. P.K.Mishra, Assistant Director of Fisheries, Sambalpur, proposed a vote of thanks.

Workshop on Industrial Fish and Fisheries

The Industrial Fish and Fisheries Department of Salipur College, Salipur, organised the captioned programme on 28.2.2001 at the Salipur college. Mr. C.R.Behera, Director, Project Swaraj, was the convenor of the Meet. Mr. R.S.Mishra, Deputy Director of Fisheries (Retd) was the co-convenor. The Principal of the college, Dr. S.Chinara inaugurated the Workshop. Experts like Dr.S.K.Mishra, Head, Deptt. of Zoology, Salipur College, Dr. P.K.Das, Reader in Zoology, Revenshaw College and S.Mohapatra, Asst. Manager, Suryo Udyog took part in the deliberations. Mr. A.Behera, Managing Director, Orissa State Disaster Mitigation Authority, lighted the traditional lamp to mark the inauguration of the Meet.

The following session was chaired by Mr. N.C. Mohanty, Assistant Commissioner of Forests with Mr. M.M.Praharja, I.G. Orissa Police Department as the co-chairman. Many social workers, trawler owners, Chairman and members of the Orissa Marine Producers Association, Paradeep and Utkal Marine Primary Fish Production and Marketing Co-op. Society, Paradeep, attended the Workshop, besides a large numbers of fish farmers, women social workers and persons engaged in fishing, fish trading and marketing.

Matters like destruction of mangrove plants and the need for mangrove afforestation in the coastal region, management of health and marketing systems of marine bases, assistance to fishermen for loss of boats and nets during the supercyclone, 1999; raising a green belt all along the 480 km length of the coastline of Orissa, provision of safety net for olive ridley turtles and study of the impact of use of TED, operations of trawlers both in inshore, offshore waters; avoidance of group clashes among fishing communities, the effect of chemical pollution due to effluent discharges, effective organisation of welfare schemes in the coastal region, steps to increase CPUE by proper management and conservation, installation of required infrastructures for proper trading etc. were elaborately discussed at the Workshop. There was also discussion on the increase of insured amount for individual fishermen operating in the high seas.

About 50 experts and more than 400 farmers and other persons in the line participated in the Workshop which has generated renewed interest in fishing and fish trade and also greater awareness among the farmers.

Serious Drawback in Shrimp Farming

A loan of Rs. 25 crores was availed of from World Bank for the development of a shrimp project at Jagatjore-Banapada patch in Mahakalpada Block. 409 ponds have been reclaimed so far since 1994 and the present problem for taking up further work on promotion of shrimp culture is the non-availability of funds for the purpose. The original condition was for the state fisheries deptt. to initiate shrimp farming under the project by 31 December of 2000; Had this been done, the World Bank would have provided a further loan amount of Rs.5 crores for inputs and other overhead expenses. This could not however be done perhaps due to the shifting of responsibilities in the SPU.

On 19.01.2001 the Director of Fisheries, Orissa, visited the sites, met 411 beneficiaries and assured them of financial assistance for initiating shrimp culture in the ponds. The loan given to each beneficiary earlier was about Rs.4 lakhs. For various reasons they could not commence culture activities as yet. Unless culture is taken up there is no chance of repayment of the loan.

Media representatives met the Director of Fisheries for having clarifications on the status of implementation of the project. The Director explained to them that culture would definitely be initiated but with financial support by the State Government. As this is the largest shrimp

culture project in Asia with full infrastructural facilities it will not be allowed to languish, he pointed out. All the officers and engineers associated with the construction of the project were present at the time, including the Chief Construction Engineer, Gopalpur Port Project. One point declared was to set right the bad condition of the approach road from Kundapur to the project site and to strengthen the protection dyke as required. The team visited all other infrastructure points like base of diesel generator set, feeder and discharge canals, treatment channels, sheds for beneficiaries, drinking water sources, electrification points including the protection dyke. It was also decided by the team to recommend the taking up of plantation around the project area for the reason that the contractors M/s. Dharitri Dredging Co. wanted to hand over the project to the Department.

Repairs to Fishery Infrastructures

During the last super-cyclone which lashed the coastal area of Orissa in October, 1999, intensive damage occured to fishing jettys, fishing harbours, fish landing centres at Kharnasi, Jamu, Tantiapal, Talchua, Khandiapatna, Bondara, Astaranga, Dhamra, Gopalpur and damages to constructed ponds and protection dykes at Jagatjore-Barapad. A proposal with an outlay of Rs.3.74 crores was submitted to repair these structures but due to non-sanction of the same the needed repairs could not be taken up till date. It has been appealed to Govt. of India for sanction of funds immediately to take up such repairs to project the interests of fishermen and the fishing industry.

Problem of NUAGADA Fishing Harbour

In the year 1978 a small fishing harbour was constructed at Nuagada located at the mouth of the river Devi at a cost of Rs.6 crores. In the year 1982 this project was damaged considerably due to severe floods. The approach road was also washed out. Now there is no approach road to reach the site. About 40 living sheds have also been damaged. Petty repairs here and there are being taken up at present which may prove to be a waste as the site could not be made operational for the benefit of fishing community. It has been appealed to the State Government to consider the situation and take steps to make the fishing harbour operational.

Olive Ridleys lay Eggs

This year Olive ridley turtles have arrived *en masse* in Orissa coastal waters and the intensity of their laying of eggs has also increased significantly compared to previous years. It has been estimated that over ten lakhs of them have laid eggs in the Gahirmatha reserve, and about two lakhs of them in the estuary of the river Rusikulya compared to 12,000 during 1998. It has also been recorded that there was no such laying of eggs in Rusikulya in 1999 and 2000.

The Forest Department took steps to guard the laying ground with the help of about 10 watchers to protect them from destruction from dogs and jackals. But it was surprising that during the period of migration and laying of eggs trawlers were being operated inside the restricted zone of both offshore and inshore waters which needs to be taken care of in future.

Awarness Camp for Afforestation of Mangrove Plants

An Awareness Workshop and training camp was originised by the Department of Forests at Jaleswar for protection of mangrove forests in the coastal belt and also for promoting awareness for mass afforestation of mangrove plants in the region. Mr. Anant Bhanja attended the Workshop as Chief Guest. Ranger K.Mohanty and forest guard S.Nayak played an active part. It was alleged that about 1000 ha out of 1400 ha were in forceful occupation by encroachers at present and this area needed to be vacated for such plantation. There was assurance from the Forest Department for supply of saplings free of cost to villagers in the coming season for plantation.

NEWS IN BRIEF

Gagankumar Dhal takes over as Director of Fisheries

Mr. Gagankumar Dhal, IAS, has taken over as Director of Fisheries, Orissa, on 17.3.2001, in place of Mr. Niten Chandra, IAS transferred to the Deptt. of Water Resources as Additional Secretary to Govt.

Seizure of Trawlers

The coastguard vessel 'Sucheta Kripalani' apprehended two Thai fishing trawlers off Paradeep Coast with 47 crews on board. A case has been lodged with the A.S.P. Rajesh Kumar and the facts are being investigated.

Block Level Farmers Meet

A Block level Fish Farmers Meet was organised at Gop Block (Dist. Puri) under the technical guidance of Mr. P.K.Bisoi, FEO,Gop. Around 150 fish farmers attended and took part in the deliberations. Senior scientists from CIFA, namely Dr. A.N. Mohanty,Dr. S.C.Rath, Mrs. Manish Mohanty, Mr. P.C.Panda, DSF and S.Baral, FEO, Khurda Block, among others, participated. They addressed the farmers on subjects like freshwater fish and prawn farming and their impact on environment.

FOR THE KIND ATTENTION OF OUR SUBSCRIBERS

Esteemed Subscribers of *Fishing Chimes* are aware that there has been revision in the postal tariff, effective May, 2001. As the journal is run on shoe-string budget, in an effort to meet the additional expenditure involved because of this, we had to reluctantly revise the annual subscription rate of *Fishing Chimes* to Rs. 780/- (present annual subscription rate is Rs. 720/-), with effect from May 2001. This marginal increase will be included in the renewal subscription bill.

Editor & Publisher
Fishing Chimes

RAJASTHAN NEWSLETTER

From **V.S. Durve**

Fish-Seed Production Performance in the Year 1999-2000 and Seed-Rearing Managment in Rajasthan

Rajasthan is categorised by many as a non-fish seed producing State because of hostile climatic conditions and probably because of the prevalent higher alkalinity of water. While this categorisation is justified because of seed produced in small quantities in several districts of Rajasthan before, the present status is to the contrary. There are pockets of good fish-seed production in the State like Bhilwara, Udaipur, Banswara and Kota. Further, of late,Sriganganagar district has emerged as a potential fish-seed producing area. Much of the seed produced is through circular hatchery technique using ovaprim or ovatide.

In the year 1999-2000, the seed production target for the State was fixed at 27 crores nos, out of which the achievement was 23.85 crores nos, i.e., 88.34%. Sriganganagar district with a target of 1.80 crores nos, exceeded it producing 3.16 crore nos. Similar was the case with Kota district which had a production target of 2.85 crore nos., but crossed this with a production of 3.08 crore nos. Such higher level of seed production also took place in Bharatpur (target 1.60 crore nos., and production 2.38 crore nos.), Bhilwara and Dungarpur districts.

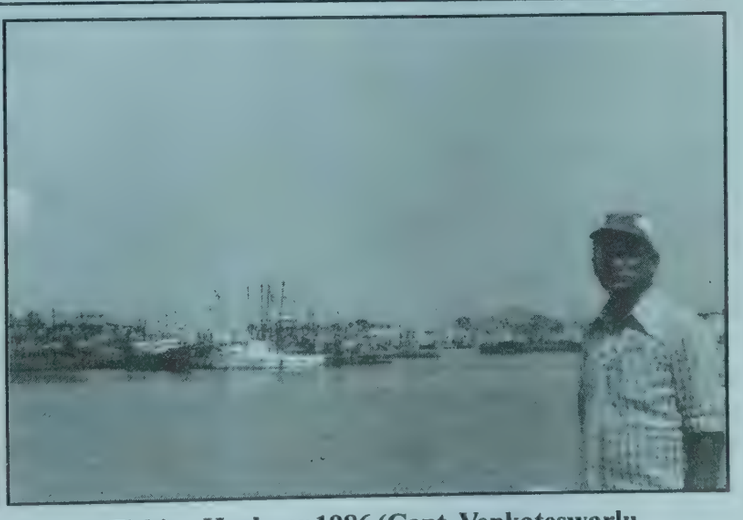
Out of the total seed prouction of 23.85 crore nos, contribution from the departmental sources was 6.19 crores, from fish farmers and contractors 13.93 crores and 3.73 crore nos from private hatcheries. The production from departmental sources was only 26.00% in spite of having the facility of two national fish-seed farms and several circular hatcheries. The share of contractors who, as per rules, have to stock the waters taken on lease by them, is unpredictable as there is vast scope to manipulate the figures. So is the case with seed production from private hatcheries.

The main problem with seed production in Rajasthan is its low survival at early fry stage probably due to uncertain climatic changes. There could also be some genetic deficiencies in the broodstock. As such, in a total fishery scenario, the seed production figures have a lesser significance. As culture catch per hectare is related to quality seed production and stocking, CIFA may have to undertake a study of the brooder and seed production problems of Rajasthan and advise the State Government on the measures to be taken in a project form to rectify the situation.

Until this intervention is made and application of the recommendations take place, the import of spawn from neighbouring states and growing them to fry stage for stocking in a chain of seed rearing centres located near big perennial reservoirs and also within an easy reach to small and medium sized reservoirs would probably be a purposeful approach. In pursuing this line of action, the whole cycle of rearing and stocking should be so scheduled that every 15-20 days a fresh consignment of seed is received at these farms while the already reared seed is stocked in reservoirs under proper supervision and in the presence of local fishermen/stake holders.

Interestingly, it is reported that heavy mortality of fish-seed at early fry stage referred to above does not occur in the case of imported seed. This indicates an urgent need of research and investigation in this field to understand the mortality factors and the possible remedial measures to eliminate them.

First Imported Mexican Trawler being unshipped at Visakhapatnam Harbour in June 1978



Fishing Harbour 1986 (Capt. Venkateswarlu in the foreground)

Acknowledgement : *Photos received from Capt. N. Venkateswarlu*

UTTAR PRADESH NEWS LETTER

From **Sunit Kumar Singh**

Pollution at alarming Level in U.P. Rivers

As per the report of National Pollution Monitoring Board, most of the rivers passing through Uttar Pradesh are highly polluted. The aquatic animal life is under threat due to excessive pollution. Most of the rivers are polluted by sewage and industrial effluent discharges into rivers. After investigations, it has been found that River Hindan is the most polluted in its downstream at Saharanpur. The biological oxygen demand (BOD) has a range of 24-25 mg/l. The number of coliform bacteria are also stated to be very high in river waters. It shows that there is no control on release of effluents into this river.

The Ganga river is found to be very much polluted at Varanasi. The BOD is found to be 13.60 mg/litre and dissolved oxygen (DO) is found to be zero ppm. The number of coliform bacteria has crossed a limit and reported to be 2 lakh 62 thousand/100 ml of water. More or less same condition is prevailing in rivers at Kanpur and Garhmukteshwar. Along with higher level of BOD, the number of coliforms is reported to be 11 lakh/ 100 ml of water in Kali river at Kannauj. The BOD level is also higher in Ramgarh Tal of Gorakhpur. Gomti river stretch at Lucknow and Yamuna in Agra are also highly polluted. The increased pollution is also responsible for decline in fish population in the rivers.

NRCCWF participates in Millennium International Festival

National Research Centre on Cold Water Fisheries, (NRCCWF) Bhimtal in close collaboration with the Kumaon Mandal Vikas Nigam (KMVN) participated in an International Mahseer Angling Festival at Pancheswar on the river-Kali last year. The NRCCWF scientists Dr.Shyam Sunder, Dr.B.C.Tyagi and Dr.K.D.Joshi, apart from participating in the festival, also organized an exhibition at Camp site, depicting the efforts of NRCCWF in artificial propagation and conservation of golden Mahseer. The festival helped to put across a message that angling conducted as per rules, is environmental, friendly and the activity provides food, employment and conservation which are our national priorities. The rural folk could benefit from angling tourism while protecting the endangered Mahseer. These stake holders living near to ecosystem can guard against poaching, blasting, poisoning, electrocuting and other destructive methods and also check the deforestation.

Bio-Diversity Assessment of Central Himalayan Rivers

The National Research Centre on Cold Water Fisheries, Bhimtal, initiated programme on biodiversity assessment of various river systems and their important tributaries in Central Himalayas (Kumaon & Garhwal hills). The drainage system of Kumaon and Garhwal hills in Central Himalayas comprises mainly the Kali, the Western Ramganga, the Ganga and Yamuna with important systems such as the Saryu, the Kosi, the Alakhnanda and the Bhagirathi. The inventory of Fish fauna revealed the presence of 25 species from Garhwal region and only 16 species from Kumaon region. The fish catches were normally dominated by indigenous snow trouts (21.2 - 100%) and Mahseers (3.5 - 56.7%) while other species did not contribute significantly to catches. The estimated CPUE in these upland river systems ranged from 65-1865 g/man/hr. In terms of natural feed resources, the systems are rich in bottom fauna represented by mayflies and caddis larvae. The plankton populations were found to be very low.

Participation in NATP Workshop at CICFRI, Barrackpore

Dr. U.P. Singh, Dean, College of Fisheries Science, Pantnagar participated in

Dr. U.P. Singh, Dean
College of Fishery science, Pantnagar

the Workshop on "Fisheries Management in the lentic system: Stocking of Reservoirs with fish seed" under National Agriculture Technology Project (NATP) at CICFRI, Barrackpore (Jan 29-31, 2001). Singh, who is the Principal Investigator, NATP, G.B.Pant Univ. of Agrill. & Tech. Pantnagar presented a status paper on "Dhaura Reservoir" at the Workshop. He pointed out that Dhaura reservoir was a medium but seasonal reservoir of the Tarai region with a total area of 1200 ha. He said that administrative control and maintenance of Dhaura reservoir, located across Dhaura and Catna rivers, was under the control of the State Irrigation Department. Dr.Singh brought out physico-chemical parameters, biotic community, catch percentage details, potential yield and socio-economic status of fisheries of Dhaura reservoir in detail. He suggested certain important measures for the proper management of Dhaura reservoir. These were:

1. Coordination between the agencies involved in the reservoir management should be strengthened.
2. Cage culture of fish species suitable for culture in the reservoir should be encouraged.
3. Fishing community engaged in fishing should be trained in fishing and net webbing, and
4. Regulation of mesh size is to be introduced.

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